



INTERCOMPARISON EVALUATION MINERALS AND NUTRIENTS IN WATER STUDY III

**based on results reported for twenty parameters
by eighteen participants as part of the quality
control program for PLUARG, Task C, IJC.**

October 1976



Ontario

**Ministry
of the
Environment**

The Honourable
George A. Kerr, Q.C.,
Minister

K.H. Sharpe,
Deputy Minister

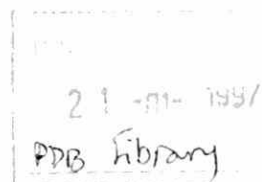
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INTERCOMPARISON EVALUATION

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IN WATER

- STUDY III -

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control program for PLUARG, Task C, IJC.

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Quality Control Program
Ontario Ministry of the Environment
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PLUARG Intercomparison Studies

Evaluation: Minerals and Nutrients in Water III

- October 1976

Introduction

At the International Joint Commission's Reference Group on Pollution from Land Use Activities (PLUARG) Task C Analysts' meeting, held in Toronto October 1976, inter-laboratory check water samples containing nutrients and minerals, were distributed.

These samples, prepared by staff of the Ontario Ministry of the Environment Laboratory Services Branch (OME), were to be analyzed by each of the participants, for those parameters routinely being reported by them for the PLUARG program. Ten of the mineral parameters (major ions) and ten nutrient parameters (nitrogen and phosphorus) were potentially analyzable. Eighteen laboratories participated.

Each analyst was requested to initiate testing as soon as possible after returning to his laboratory. The samples were not to be treated specially, but analyzed during a routine run if at all possible. Results were to be reported, in confidence, to the PLUARG Task C coordinator, by November 18th, 1976.

The results received at the Great Lakes Regional Office of the IJC were subsequently compiled on spread sheets and evaluated by means of a rank order method by laboratory. These spread sheets and the evaluation, with appropriate comments, were distributed to the analysts.

The following evaluation, prepared by staff of the Laboratory Services Branch, OME, is based on the compiled results reported on the spread sheets and from results reported by other laboratories not involved in the PLUARG program. The difference regression analysis technique employed permits estimates to be made of the precision and blank or slope bias for each parameter for each participant.

Samples

The 12 samples were a mix of standard solutions, natural samples, and spiked samples as described below. They were distributed at a meeting of PLUARG analysts held at the OME Central Laboratories, on October 28th, 1976. They were submitted in 500 ml new polystyrene containers, prerinsed four times, with deionized distilled water and then filled and left to soak for about 1 week. At the time of sample splitting, each container was rinsed with a well-mixed portion of the sample, passed from container to container. This preconditioning with sample was repeated four times to minimize the possibility of contamination. Caps were prepared at the same time. The containers were then filled, a little at a time, sequentially, with well-mixed sample, to ensure that all subsamples were identical. The samples were then kept refrigerated at 4°C until distribution.

The samples and standards were selected to fall within the ranges found routinely in rivers of Southern Ontario as reflected in the routine operating ranges employed by the River and Lakes laboratory, Water Quality Section, OME. (see Table I)

<u>Minerals</u>	<u>Nutrients</u>	
#1	#7	High concentration standards.
#2	#8	Low concentration standards.
#3	#9	Mixed composites of Reeve Angel 934AH glass fibre filtered natural river samples, 'stabilized' about 1 week prior to subsampling.
#4	#10	Above natural sample spiked with a small aliquot of standard solution.
#5	#11	Above natural sample spiked with larger aliquots of standard solutions.
#6	-	3:1 diluted Toronto tap water.
-	#12	Fresh Humber River sample, sampled and split a few hours before distribution.

All standard solutions used in preparing the above samples were checked against EPA reference ampoules and found to be satisfactory. Target values are given in Table I. (There was no nitrite added to the standards or the samples).

The spiking standards were prepared from inorganic salts so that failure to recover, (or over recovery), must be attributed to calibration error rather than digestion efficiency, eg. Total Phosphorus or Total Kjeldahl Nitrogen.

The samples were filtered (except #12) in order to increase their stability and to avoid any problems due to sample inhomogeneity.

Table I: Concentration ranges and expected values

	River Lab operating range	Concentration range of samples	Expected values			
			Standards	Spikes		
			(Spikes added to 3 or 9)			
			<u>1</u>	<u>2</u>	<u>4</u>	<u>5</u>
<u>Minerals:</u>						
Ca	0.2 - 20.	4 - 40	25.0	4.50	4.00	12.5
Mg	0.05 - 6.0	2 - 15	12.5	2.25	2.00	6.25
Na	0.1 - 10.	4 - 30	28.0	5.60	7.00	14.00
K	0.05 - 30.	0.4 - 20	19.5	3.90	4.88	9.75
Hard.	calc.	20 - 150	114.2	20.6	18.3	57.5
Alk.	1. - 240.	25 - 70	0	0	nil	
Cl	0.05 - 50.	10 - 75	74.5	13.7	13.5	37.2
SO ₄	0.5 - 50.	10 - 110	104.2	19.8	21.6	52.1
Si	0.05 - 5.0	0.03 - 1.0				
Cond.	150 - 500	100 - 600	see note			
<u>Nutrients:</u>						
			<u>7</u>	<u>8</u>	<u>10</u>	<u>11</u>
Tot P	.001- 0.20	0.03 - 0.15	0.125	0.0375	0.025	0.075
FTP	.001- 0.20	0.02 - 0.15		ditto		
FRP	.001- 0.10	0.01 - 0.15		ditto		
NH ₄	.005- 0.50	0.1 - 1.5	1.25	0.375	0.25	0.75
NO ₂	.001- 0.10	(0.00 - 0.02)		nil		
TNO ₃	.005- 1.0	0. - 1.	0.625	0.188	0.125	0.375
Tot N	n/a	0.5 - 2.5	1.875	0.565	0.375	1.125
TKN	.01 - 2.0	0.3 - 1.5	1.25	0.375	0.25	0.75
TIN	n/a	0.5 - 2.0	1.875	0.565	0.375	1.125
Org N	n/a	0.0 - 0.5		nil		

Note: Samples 3, 6, 9 and 12 were unknowns

Note: based on averages reported for mineral parameters, the calculated conductivity for samples 3, 4, 5 and 6 are respectively 235, 318, 430 and 115. Samples 1 and 2 contained acid, therefore, alkalinity should be zero.

Discussion

Analysts were to select, from among the following, those parameters for which they were providing data to the PLUARG program. They were to filter the samples if this was part of their routine procedure.

Minerals: Calcium as Ca, Magnesium as Mg,
Sodium as Na, Potassium as K,
Hardness as CaCO_3 , Alkalinity as CaCO_3 ,
Chloride as Cl, Sulphate as SO_4 ,
Reactive Silicates as Si, Conductivity
in $\mu\text{mho/cm}$

Nutrients: Total Phosphorus as P, Filtered Total
Phosphorus as P, Filtered Reactive
Phosphates as P, Ammonium as N, (Nitrite
as N), Nitrate (+ Nitrite) as N, Total
Nitrogen as N, Total Kjeldahl Nitrogen
as N, Total Inorganic N, Organic N

Some participants perform direct analysis for certain parameters, whereas others determine the result by calculation based on results for other parameters. The relationships are as follows:

$$\text{Hardness} = (2.50 \text{ Ca} + 4.12 \text{ Mg}) \text{ as } \text{CaCO}_3$$

$$\text{Mg} = (\text{Hardness} - \text{Ca as } \text{CaCO}_3) / 4.12$$

$$\text{Total N} = \text{TKN} + \text{Nitrate (+ Nitrite)}$$

$$\text{TIN} = \text{Ammonium} + \text{Nitrate (+ Nitrite)}$$

$$\text{Org. N} = \text{TKN} - \text{Ammonium}$$

The analysts were requested to initiate testing as soon as possible after arriving back at the laboratory. The samples were not to be treated specially, but analyzed during a routine run if at all possible. Results were to be reported to Dr. Darnell Whitt, in confidence, by November 18th, 1976.

Some of the labs participating in this study do not contribute data to the PLUARG program but were included in the study to assist them in their own quality control program and to provide a wider base of participants.

The laboratory numbers were assigned by Dr. Darnell Whitt at the Regional Offices of the IJC in Windsor. Results were forwarded to him by the analysts for tabulation. The summarizing tables of data were distributed to the analysts for comments in early March 1977.

The appendices provide tables and figures depicting the performance by parameter and/or lab. The basis for the evaluation is linear regression as described below.

Data Evaluation

The following evaluation depended upon the development and testing of a computer program for a Hewlett-Packard 9825A calculator with plotter and printer accessories. Several trial programs revealed further insight into the application and validity of the Difference Regression procedure for data evaluation. The following is a review of the basic principles involved.

- 1) The results Y reported by the participants are averaged to obtain preliminary estimates of the reference value X to be expected for each sample.

- 2) The values $D = (Y - X)$ for each sample are plotted versus X to obtain the following estimates

b_D = deviation in slope (estimated) from zero

a_D = deviation in intercept (estimated) from zero

$s_{D \cdot X}$ = standard deviation of the observed values about the line $D = a_D + b_D X$

r_D = correlation coefficient of D on X
(expected to be zero, but approaches unity if $b_D \neq 0$)

- 3) Laboratories demonstrating unusually high estimates relative to the more comparable labs are excluded from further averaging since it can be expected that their results are not as reproducible ($s_{D \cdot X}$) or are biased (a_D or b_D) in some way and will therefore affect the averaging. (Indicated by an asterisk against the laboratory number).

- 4) The remaining labs are then averaged and new estimates of the nature and extent of their agreement to the average are prepared.

- Labs who differ by more than 5% in slope from the new averages ($b_D = 5\%$) are now excluded to prevent biasing the averages for the high samples.
- Labs with noticeably deviant blanks (a_D) and/or precision ($s_{D \cdot X}$) are removed to prevent bias in the final estimates of the low reference averages.
- In some cases only 1 of the 6 results may be deviant for a given lab. (Gross error or typographical mistakes). If the error is obvious, eg. slipped decimal it is noted and 'corrected' to permit the remaining data to be included in the averaging. Otherwise the value is deleted (in almost every case performance on the remaining samples is sufficiently poor to require that the lab be excluded).

NOTE: Exclusion of a lab's data does not imply poor performance, but only that one or more of the 6 values was not reported or deviated significantly from the values reported by the other analysts.

NOTE: The plotted lines show trends averaged over the range. In most cases most points fall close to the line but occasionally an outlier will bias the slope and blank estimates. Appendix II shows a plot of the data for each lab over all parameters analyzed by them. This permits closer examination of performance, and cross comparison between labs.

NOTE: In almost all cases, the less precise labs are more prone to gross error, and bias. In many cases the poorer precision reflects the use of a less sensitive operating range. Under these conditions they may be unable to detect the bias, but this does not make it less real.

NOTE: The correlation coefficient is a measure of the significance of slope bias. If a lab is very precise, even small deviations will be statistically significant. On the other hand, less precise labs will be 'permitted' a larger deviation in slope before r_D becomes significant. The possibility that r_D will be greater than 0.35, 0.61, 0.73 or 0.81 is respectively 50%, 20%, 10% and 5% (for 4 degrees of freedom ie 6 samples).

NOTE: The average deviation \bar{D} has a standard deviation s_D . If D is dependent on concentration, as suggested by the least squares regression equation, then $s_{D \cdot X}$ must be less than s_D . In fact r_D is a measure of the fraction of s_D which has been 'explained' by using the equation $D = a_D + b_D X$. The quantity $s_{D \cdot X}$ is a measure of the residual unexplained data scatter which is here attributed to lab imprecision.

One may choose, in the tables in Appendix II between

a) average deviation \bar{D} with std. dev. s_D , or

b) $D = a_D + b_D X$ with residual std. dev. $s_{D \cdot X}$

In general the linear relationship is more flattering in terms of precision, but may occasionally be misleading as to bias.

NOTE: A problem lab is one with gross biases relative to their own ability as reflected by $s_{D \cdot X}$ and r_D . Less sensitive labs are not poor labs but their data may be unsuitable to the needs.

Two appendices are provided to assist the participant in evaluating his own performance and to clarify the between-lab compatibility as revealed by the Difference Regression technique. The conclusions, based upon a review of the data in the appendices, are summarized in Tables IV and V.

NOTE: The participant's identity numbers were different for the Nutrient samples as compared to those for the Mineral samples.

The diagrams in the appendices are plots in which the adjusted average is shown on the horizontal axis. The vertical axis shows the deviation of the result reported by each participant, relative to the adjusted average of the "best" participants. The vertical scale is $\pm 10\%$ of the horizontal scale. The equations are given in the associated tables.

Appendix I

The data input to the HP9825 calculator is tabulated for each parameter in appendix I (in the middle of the page). The overall (or preliminary) average, the final (or adjusted) average, and the expected value is given for each sample at the bottom of the page. Also shown is the standard deviation of included participants about these averages. For the unknowns, the expected value equals the adjusted average. The amount spiked into the unknowns is then added on to determine expected values for the spiked samples.

The two tables at the top of the page give the equation of the line relating deviation to concentration for each participant. Both tables are shown to demonstrate the improvement made by excluding some participants from the averages. The line identified by #21 gives standard deviation over all data for the included participants. It can be compared against the standard deviation obtained for each sample.

The diagrams at the bottom of each page in appendix I compare the calibrations for the excluded labs (on the left) against those for the included labs (on the right). The excluded labs, indicated by an asterisk at the top of the page are those found to be less precise ($s_{D \cdot X}$), and/or biased more than 5% in slope, and/or with a blank bias of more than about twice the average value of $s_{D \cdot X}$ for the better labs, as noted earlier.

Appendix II

Diagrams, comparable to figures 1 and 2, were produced for each participant for each parameter. These show the fit of his data to the statistically calculated line, and permit him/her to assess the validity of the line. (In a few cases the position of the line has been affected by one of the reported values).

The tables associated with appendix II repeat the linear equations for each participant by parameter. One has the choice of rejecting the line $D = a_D + b_D X$ with standard deviation $s_{D \cdot X}$ in favour of the simple average deviation \bar{D} and its standard deviation s_D , as noted earlier.

Findings

In this particular study, as shown in figures 1 and 2, the expected values deviate little from the adjusted values. It is necessary to use the latter as the reference because some of the samples are unknowns and because the solutions used for standards may be in error by very small (but real) amounts. The priority need is to demonstrate compatibility between participants. Figures 1 and 2 then can be used to demonstrate the average bias, if any, of the better participants based on the standards included in the study.

There were a few cases where biases were found. Potassium and chloride were under-recovered on average by 3.9% and 3.5% respectively. The TKN high standard was over recovered by 0.17 mg/l N and a blank of 0.08 was reported for Organic N in the standard solutions (instead of 0.00). There was also some problem with sulphate in the high standard.

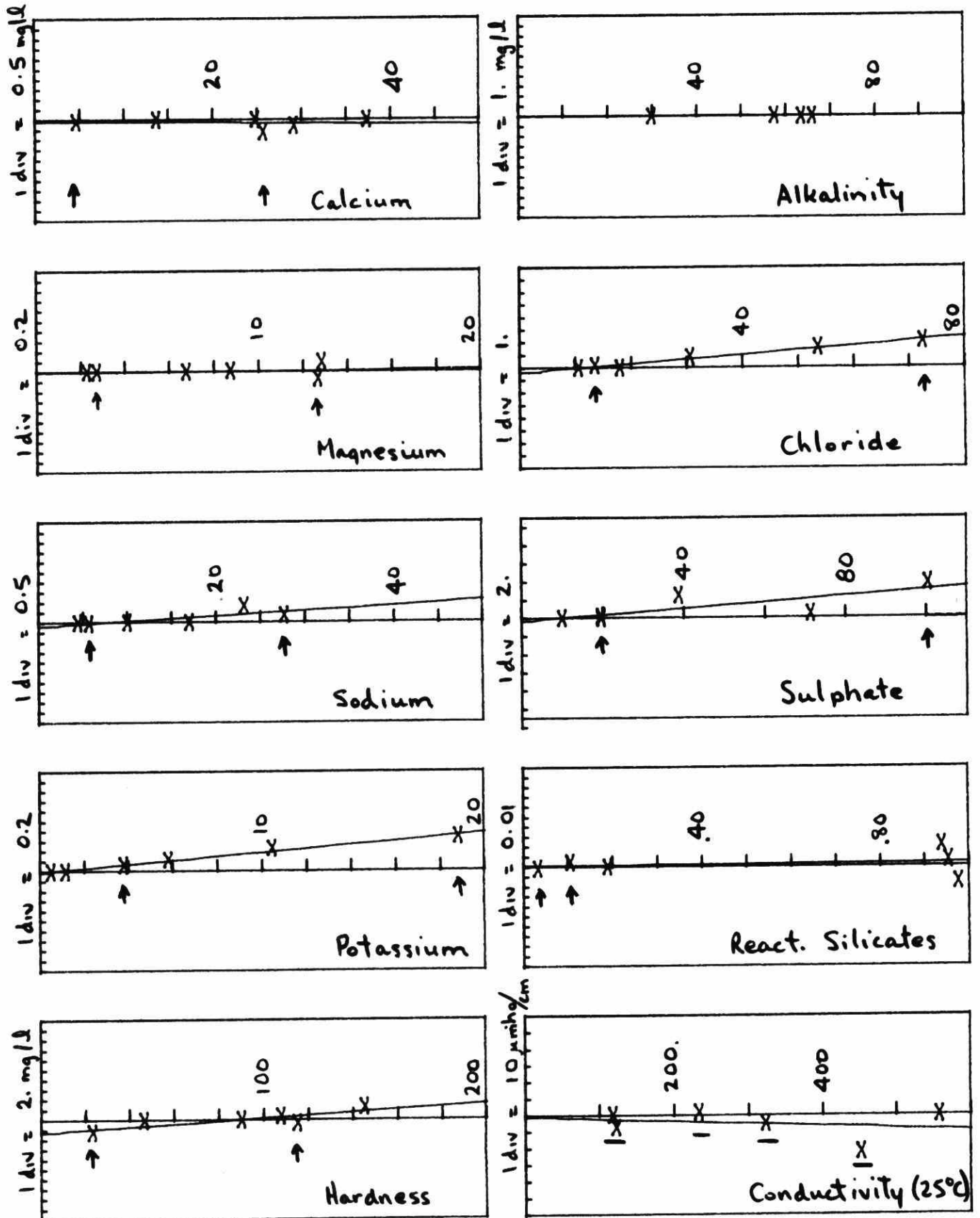
It should be noted, since the samples were prefiltered and the standards were made from inorganic salts, that the three phosphorus diagrams should be essentially identical. Similarly, except for precision, the ammonia and the TKN diagrams should be the same. The nitrite and organic N diagrams are included for interest only. It is assumed, within the precision of analysis, that Nitrate = Nitrate + Nitrite for all participants. Conductivity was calculated for the natural and spiked samples using the "adjusted average" values reported by the best participants for each of the major ions. It was noted that the ionic balance for these values was well within $\pm 5\%$.

Generally there is no strong support for the position that samples may have decomposed, eg. ammonium to nitrate. In every case TKN recovery did not confirm the severe under-recovery reported by some participants for ammonium. Some labs were inconsistent in reporting phosphorus in its various forms. Since all Nutrient samples except #12 were filtered, there were no particulates present to affect sample homogeneity, therefore, problems encountered in these parameters would reflect non-reproducibility of digestion and/or filtration blanks.

In most cases there is a clear distinction between those labs exceeding the $\pm 5\%$ slope deviation criteria and those meeting it. They are often less precise and occasionally have blank difficulties. In only a very few cases is the slope estimate biased by the presence of one poor result among five good ones. In most cases slope biases are defined quite precisely. Some labs display compensating blank and slope bias so that they are OK in the middle of the range examined. Of course this is not a desirable mode of operation.

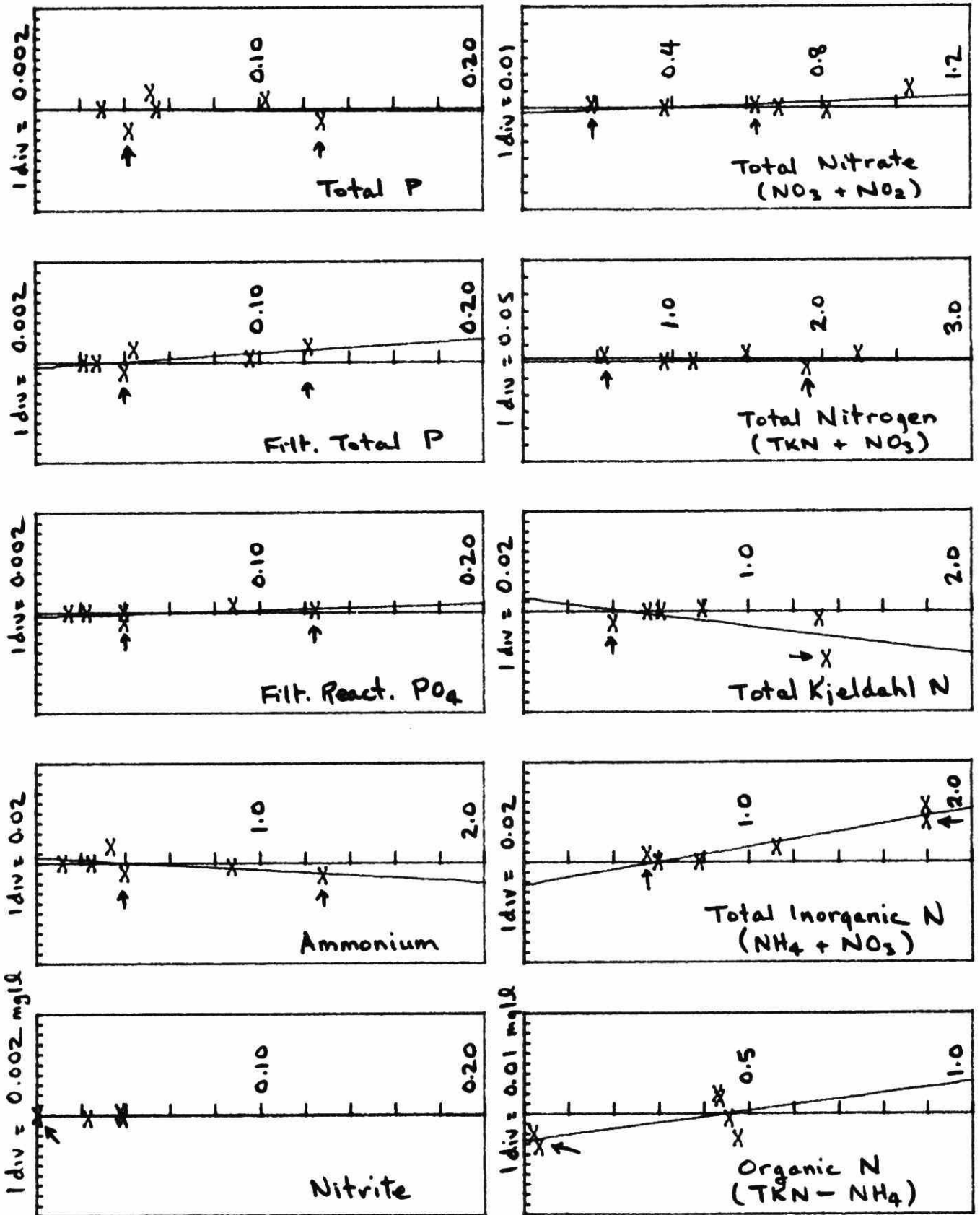
In most cases the calibration intercepts a_D seem to be well controlled. Since the linear equation passes through the point \bar{X}, \bar{D} the estimates a_D are dependent upon the

Fig. 1 : Minerals - Deviation of Expected Values from the Adjusted Averages



↑ = standards
- = calculated Conductivity

Fig. 2 : Nutrients - Deviation of Expected Values from the Adjusted Averages



↑ = standards

TABLE II: Relationship between Expected and Adjusted Averages

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-0.17	0.27	0.27	-0.09	-0.37	-0.18
Mg	0.01	0.12	0.12	-0.01	0.28	0.12
Na	0.19	0.38	0.26	-0.19	2.60	0.73
K	0.249	0.305	0.040	-0.014	3.91	0.99
Hard	0.0	1.8	1.1	-2.5	2.87	0.81
Alk	0.01	0.04	0.03	0.06	-0.10	-0.58
Cl	0.79	1.00	0.17	-0.38	3.54	0.99
SO4	1.16	1.79	1.18	-0.30	3.39	0.75
Si	0.003	0.013	0.013	0.001	0.27	0.10
Cond	-5.3	10.0	9.5	-1.0	-1.42	-0.28

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0002	0.0031	0.0031	-0.0000	-0.34	-0.05
FTP	0.0008	0.0021	0.0017	-0.0008	2.79	0.61
FRP	0.0000	0.0012	0.0011	-0.0006	1.22	0.48
NH3	-0.003	0.023	0.020	0.011	-2.57	-0.54
NO2	-0.0001	0.0003	0.0003	-0.0001	-0.05	-0.02
PNO3	0.005	0.011	0.009	-0.005	1.57	0.51
TN	0.007	0.018	0.018	0.010	-0.19	-0.07
TKN	-0.021	0.043	0.034	0.026	-5.62	-0.59
TIN	0.040	0.051	0.017	-0.044	7.58	0.94
OrgN	-0.008	0.024	0.019	-0.026	5.91	0.60

validity of the estimate b_D . For four degrees of freedom the estimate b cannot be assumed different from zero if r_D is less than 0.61 (80% probability) or 0.81 (95% probability). If r_D is greater than 0.61 for a less precise participant it might be postulated however that his calibration is out of control if not in fact biased.

It is interesting to observe that statistically the very precise labs will find a significant r_D for very small values of b_D , whereas large deviations in b_D will be statistically "invisible" to the less precise participants. This fact should not be used by the latter to excuse potential bias. Analytically speaking, calibration should be readily controllable within 10%.

Since the slope b_D is an estimate based on only a few data, it is useful to know how large it would have to be in order to have been statistically detectable by the participant. This can be determined by reference to a t-test where the calculated value of t (for 4 degrees of freedom) given by

$$t = b_D / s_b = (b_D \cdot s_{D \cdot X}) / (s_X \sqrt{n-1})$$

should not be larger than 0.74, 1.53, 2.78 or 3.50 more than 50%, 20%, 5% or 2.5% of the time respectively. Since $s_{D \cdot X}$ is known for each participant and parameter, and since s_D is fixed for each parameter in this study (see table III), it is possible to calculate the critical value of b_D for a given critical value of t .

Table III Values of s_X for PLUARG study III

$$s_X^2 = \Sigma (X - \bar{X})^2 / (n-1)$$

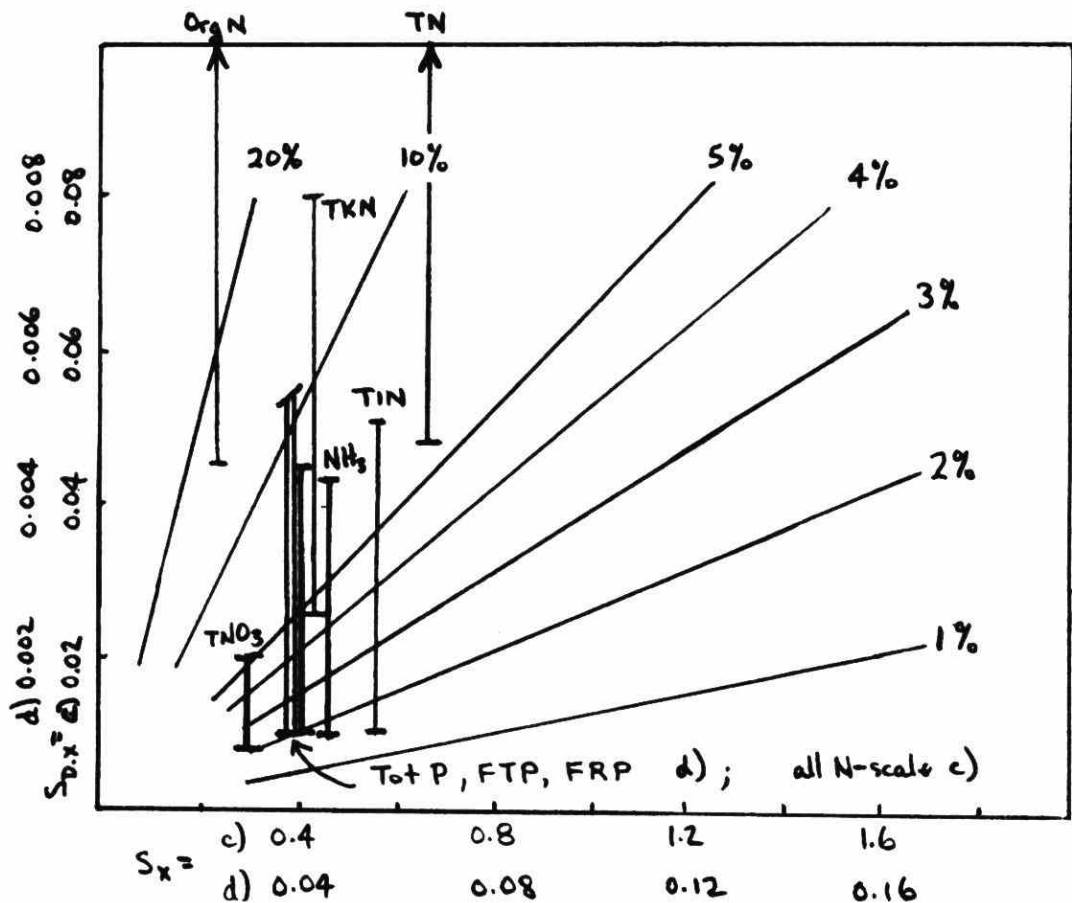
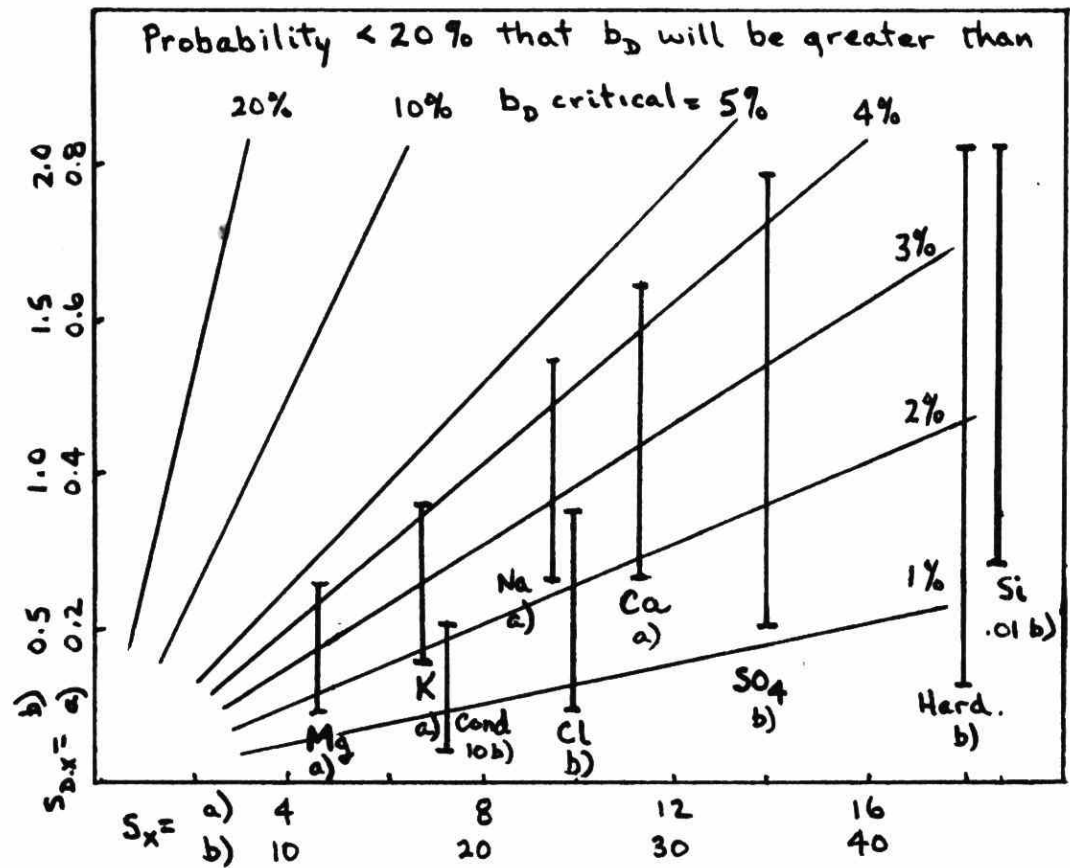
Minerals				Nutrients			
Ca	11.63	Alk	(16.58)	Tot P	0.0384	TNO ₃	0.304
Mg	4.63	Cl	24.86	FTP	0.0408	TN	0.641
Na	9.54	SO ₄	35.47	FRP	0.0426	TKN	0.411
K	6.92	Si	0.467	NH ₄	0.4434	TIN	0.570
Hard.	45.41	Cond.	178.5	NO ₂	(0.0093)	Org N	0.219

In figure 3 the critical value $t = 1.53$ was used. The starting lines give the critical value of b_D for selected values of $s_{D \cdot X}$ and s_X . The probability of exceeding this value by chance is less than 20% (or 1 in 5). (The values $b_D/2$ or $2b_D$ would be exceeded with less than 50% or 3% probability respectively).

For each parameter (known s_D) a vertical bar has been drawn showing the range of critical b_D found for the better participants. By extending this bar upwards, the excluded participants (known $s_{D \cdot X}$) can estimate their ability to detect slope bias.

It can be seen that for the mineral parameters the better labs could be expected to maintain a slope compatibility within 2 to 5% about 80% of the time. However for the nutrient parameters even the better participants may be having problems maintaining slope bias within 5 to 10%, particularly where sample digestion is required.

Figure 3 : Bars indicate range of b_D critical encountered amongst the more precise participating labs. ($t = 1.53$; d.f. = 4)



Problem Areas - Minerals

- Lab 1: - Potassium data high, conductivity OK
- Lab 2: - severe overrecovery Mg, potassium slightly low?
- Hardness imprecise or compensating biases
- Alkalinity, chloride, calcium and sodium OK
- severe underrecovery conductivity
- Lab 3: - Hardness and calcium OK, magnesium imprecise
- alkalinity and conductivity OK
- severe blank in chloride, Na overrecovered
- Lab 4: - Hardness and calcium OK, magnesium fair (1 sample wrong)
- Na, K, Alkalinity, chloride, good
- sulphate and conductivity underrecovered
- Lab 5: - no apparent problems, (sulphate slightly low?)
- Lab 6: - Ca imprecise, Mg overrecovered
- Na slight positive blank, conductivity underrecovered
- potassium OK
- Lab 7: - calcium imprecise (and low?), chloride less precise
- Mg, Na, K, Hardness, Alkalinity, sulphate, silicate good
- Lab 8: - Hardness and calcium slightly high (blank), Mg imprecise
- sodium imprecise, K agrees with expected values
- chloride, silicates, conductivity good
- sulphate high standard underrecovered
- Lab 9: - no apparent problems (sulphate slightly low?)
- Lab 10: - Hardness and calcium OK, magnesium imprecise
- sulphate, one sample low
- conductivity underrecovered
- Na, K, alkalinity, chloride, silicates good
- Lab 11: - sodium, slight positive blank
- alkalinity low, silicates high, chloride less precise
- Ca, Mg, Hardness, K, SO₄, conductivity good
- Lab 12: - no apparent problem except chloride underrecovered
- Lab 13: - potassium, conductivity and silicates OK
- calcium, magnesium, sodium, imprecise and/or under-recovered
- chloride significant positive blank
- Lab 14: - no apparent problems (silicates low?)
- Lab 15: - data unreliable (Cl, SO₄)
- Lab 16: - Ca and Mg OK
- Lab 18: - Ca imprecise?, Hardness and Mg severe overrecovery
- alkalinity? (insufficient data)
- chloride good
- sulphate low (one sample in particular)
- conductivity severe underrecovery

Problem Areas - Nutrients

- Lab 1: - Nitrate data imprecise but Ammonia + Nitrate OK
- Lab 2: - All nitrogen data biased high by significant blank problem
- Lab 3: - Imprecise TP and FTP and TKN (or TN)
- TIN results agree with expected
- NO₃ and FRP and NH₃ OK
- Lab 4: - no apparent problems
- Lab 5: - none of this data appears to be reliable
(Tot P, NH₄, NO₃, TKN)
- Lab 6: - blank problem in Tot P and FTP
- low recovery NH₄, NO₃ data high, NO₃ + NH₄ off scale
- Lab 7: - nitrate severe overrecovery, NH₄ and TKN OK
- Total P data less precise but OK?
- Lab 8: - FRP data, 4 samples high by about 0.045 mg/l
- overrecovered on high NH₄ standard, other data OK
- Lab 9: - Total N overrecovered by 42%, confirmed separately
by standards (blank +.2) and samples (blank -.15)
- ammonium underrecovered, TKN, NO₃ and TIN imprecise,
NO₃ high
- FRP high (blank), Tot P and FTP less precise but OK?
- Lab 10: - Ammonium underrecovered, NO₃ OK
- TKN less precise, slightly low compared to average
- Org N poor, phosphorus data OK
- Lab 11: - ammonia slightly low, nitrate severe underrecovery
- Total N and TIN good
- phosphorus data good
- Lab 12: - Tot P and FTP slightly low
- FRP data, high blank partially compensated by
negative slope
- ammonia underrecovered, NO₃, TIN and Total N OK
TKN less precise and low (blank)
- Lab 13: - FTP positive blank, other phosphorus data OK
- ammonia and TKN data OK
- severe underrecovery of nitrate
- Lab 14: - phosphorus data OK
- ammonia underrecovered, TKN OK but less precise
- severe underrecovery of nitrate
- Lab 15: - data not reliable (Tot P, NO₃, TN or TKN)
- Lab 16: - Tot P and FRP data good

- Lab 17: - Total P imprecise but OK?
- TKN standards OK but samples unreliable
- Nitrate data high (blank?)
- Lab 18: - Total P less precise (slightly low?), FRP data
slightly low (blank)
- ammonia slightly underrecovered but TKN data OK
- severe underrecovery of nitrate

Conclusions

Generally, the most precise (sensitive) participants were least biased and most compatible. Several laboratories were found to have serious but correctible bias for more than one parameter. Tables IV and V list the participants for each parameter and whether their data was included or excluded in the calculation process. In most cases exclusion was partially on the basis of precision. The letter code clarifies the major problem observed. Brackets suggest that the problem was not large enough to seriously affect data compatibility, based on review of the particular figure in appendix II.

For the mineral parameters labs 5, 9 and 16 were good to excellent for all parameters checked. Labs 1, 4, 7, 10, 11, 12 and 14 had only one serious problem. Labs 3, 13, 18 had correctible problems for at least 4 parameters. Labs 1, 15, 16 analyzed only two parameters. Lab 15 data is unacceptable. Labs 3, 4, 8 and 18 do not contribute mineral data to PLUARG.

For the nutrient parameters most labs had problems with the nitrogen parameters, usually with respect to slope calibration. Lab 2 had a severe blank problem for both NO_3 and NH_4 , apparently from background contamination in the lab. Labs 6 and 17 nitrate data is unacceptable. Labs 3, 11, 13, 14 and 18 were clearly under-recovering NO_3 , lab 7 over-recovered. Labs 6, 9, 10, 12, 14 clearly under recovered ammonium. Because of the generally severe biases in ammonium and/or nitrate the calculated parameters organic N, ammonium plus nitrate and total nitrogen were also biased.

Only lab 4 performed well on all nutrient parameters including the nitrogen series. Some of the labs accepted for averaging had clearly recognizable non-zero intercepts or were less precise than desirable. Very few labs excluded were found to be borderline when their data was reviewed.

Only labs 4, 9, 10, 11, 12 and 13 did at all well on the phosphorus parameters. Labs 5 and 15 were completely unacceptable for both N and P parameters. Labs 3, 6, 7, 14, 17 and 18 showed varying degrees of imprecision in their Total P data. On average their data may be acceptable for some purposes. Note that labs 14, 17 and 18 do not contribute data to PLUARG.

It must be stressed that there is no strong evidence to support sample decomposition. The blank and/or slope biases are generally well defined. Many of the participants have comparable precision, sufficient to permit them to detect and correct the biases observed.

Table IV: Summary of Performance - Minerals

<u>Lab</u>	<u>Ca</u>	<u>Mg</u>	<u>Na</u>	<u>K</u>	<u>Hard.</u>	<u>Alk</u>	<u>Cl</u>	<u>SO₄</u>	<u>Si</u>	<u>Cond.</u>
1				Es						-
2	-	Es	-	-	Ec	-	-			Es
3	-	Ec	Es		-	E	Eb			(Es)
4	(Ep)	(El)	(Eb)	-	-	-	-	(El)	-	Es
5	-	-	-	-	-	-	-	(Es)	-	-
6	Ep	Es	(Eb)	-						Es
7	Es	-	-	-	-	-	(El)	-	-	
8	(Eb)	Epb	Ep	(Es)	(Es)		-	(El)	-	-
9	-	-	-		-	-	-	-	-	-
10	-	(Ec)	-	-	-	-	-	(El)	-	Es
11	-	-	(Eb)	(El)	-	Es	(Eb)	-	Es	-
12	-	-	-	-		-	Es	-	-	-
13	Ep	Eb	Es	(El)			Eb		-	-
14	-	-	-	(El)		-	-	-	Es	
15							Eg	E		
16	-	-								
18	(Epb)	Es			Es	Ep	-	Es		Es

E - excluded in calculations

(E) - borderline problem

g - gross errors

s - slope bias

b - blank bias

c - compensating biases

p - less precise

l - one point
wrong

Table V: Summary of Performance - Nutrients

<u>Lab</u>	<u>Tot P</u>	<u>FTP</u>	<u>FRP</u>	<u>NH₄</u>	<u>NO₂</u>	<u>NO₃</u>	<u>TN</u>	<u>TKN</u>	<u>TIN</u>	<u>ON</u>
1						Epb				
2				Eb		Eb	Eb	Eb	Eb	Eb
3	Ep	Ec	(E)	(-)		-	Eb	Eb	Es	Ec
4	-	-	-	-		-	-	-	-	Ec
5	Eg			Eg		Eg	Eg	Eg	Eg	Eg
6	Epb	Epb		Es		Eg			Eg	
7	Epb	Ep	(Ep)	-	-	Es	Esp	p	Es	-
8	(Es)	-	Eb	Ec		-			(El)	
9	p	(Ep)	b	Es	-	Es	Es	-	Ec	Eb
10	-	Es	-	Es		-	Es	b	-	Eb
11	-	-	-	Es		Es	b	Es	b	
12	b	b	Eb	Es		-	-	(Ep)	(El)	Eb
13	b	b	-	-	-	Es	Es	(Ec)	Ep	-
14	Ep		-	Es	-	Es	Es	p	Es	Eg
15	Eg					Eg	Eg	Eg		
16	-		-							
17	Ep					Eg	Eg	Eg		
18	Ep		b	Sp		Es	-	(Ep)	Eps	

E - excluded in calculations s - slope bias p - less precise
 (E) - borderline problem b - blank bias l - one point wrong
 g - gross errors c - compensating biases

Most labs using the EDTA titration procedure for determining Magnesium by difference from Hardness and calcium were imprecise and/or biased. However several labs had problems with AAS analysis for the cations. Conductivity problems may be related to dirty cells or incorrect temperature correction. The colorimetric sulphate procedure has curvature which can result in the observed under-recovery of the high standard. The cadmium column procedure employed by certain of these labs is apparently not well controlled in terms of nitrate/nitrite recovery ratio. Cadmium columns with inadequate reduction capacity are prone to improper calibration due to over-recovery of nitrite and under-recovery of nitrate. The reason for precise under-recovery of ammonia is not clear. TKN and TN procedures require extensive review to improve precision. Present capability seems to be inadequate for estimating organic N.

Care should be taken by the data user when interpreting data that the nomenclature and reporting units used by each analyst are clearly understood. There is not yet a consensus among all the analysts in this area (eg. phosphorus, and silicates as Si or SiO_2). Although not essential to this report, terms such as Filtered, Dissolved, should specify the filter type used.

This study reviews only the participants ability to analyze relatively simple, stable samples. Any problems observed here would be in addition to sampling and field sources of variability and bias. Other data available for the PLUARG program, Task C (Canadian) suggests that for even the better labs, analytical precision may be the limiting factor when considering field duplicates in some cases.

Appendix I

The data input to the HP9825 calculator is tabulated for each parameter in appendix I (in the middle of the page). The overall (or preliminary) average, the final (or adjusted) average, and the expected value is given for each sample at the bottom of the page. Also shown is the standard deviation of included participants about these averages. For the unknowns, the expected value equals the adjusted average. The amount spiked into the unknowns is then added on to determine expected values for the spiked samples.

The two tables at the top of the page give the equation of the line relating deviation to concentration for each participant. Both tables are shown to demonstrate the improvement made by excluding some participants from the averages. The line identified by #21 gives standard deviation over all data for the included participants. It can be compared against the standard deviation obtained for each sample.

The diagrams at the bottom of each page in appendix I compare the calibrations for the excluded labs (on the left) against those for the included labs (on the right). The excluded labs, indicated by an asterisk at the top of the page, are those found to be less precise ($s_{D.X}$), and/or biased more than 5% in slope, and/or with a blank bias of more than about twice the average value of $s_{D.X}$ for the better labs, as noted earlier.

PLUARG Minerals III (Oct 76): Calcium

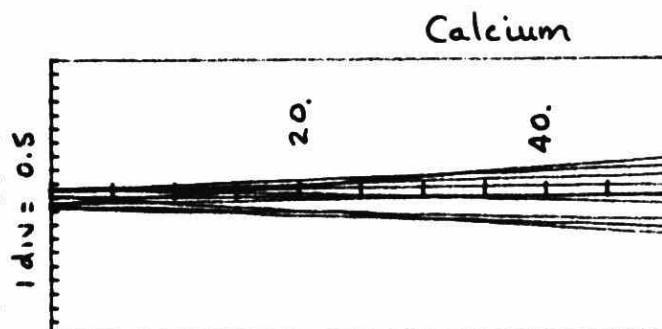
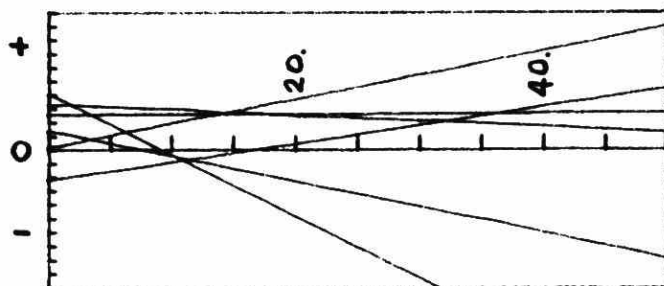
Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
2	0.32	-0.55	4.24	0.86	2	0.33	-0.23	3.27	0.79
3	0.44	0.01	2.52	0.60	3	0.44	0.31	1.57	0.42
4	1.12	0.98	1.17	0.13	* 4	1.20	1.29	0.18	0.02
5	0.73	-0.70	-0.63	-0.11	5	0.65	-0.41	-1.52	-0.29
* 6	1.67	-1.42	7.75	0.51	* 6	1.66	-1.10	6.76	0.47
7	1.03	0.40	-8.42	-0.73	* 7	1.07	0.68	-9.30	-0.75
8	0.12	1.33	-1.12	-0.77	* 8	0.19	1.63	-2.05	-0.81
9	0.30	-0.52	1.55	0.56	9	0.40	-0.21	0.59	0.19
10	0.35	-0.05	2.04	0.60	10	0.25	0.25	1.11	0.50
11	0.33	0.04	-0.35	-0.14	11	0.41	0.34	-1.29	-0.38
12	0.56	-0.26	-2.04	-0.42	12	0.51	0.03	-2.93	-0.60
* 13	2.91	1.80	-21.65	-0.69	* 13	2.86	-2.01	-22.27	-0.71
14	0.66	-0.66	-0.20	-0.04	14	0.65	-0.36	-1.12	-0.22
16	0.47	-0.02	1.24	0.32	16	0.43	0.28	0.31	0.09
* 18	1.85	-0.24	9.95	0.57	* 18	1.97	0.12	8.81	0.50
* 21	1.00	0.00	-0.00	-0.00	* 21	0.69	0.00	-0.00	-0.00

26.00	4.30	25.80	29.50	38.30	14.10	Lab 2
27.00	5.00	25.00	30.00	38.00	14.00	Lab 3
29.00	6.00	26.00	30.00	38.00	14.00	Lab 4
25.00	4.50	23.00	28.00	37.00	13.00	Lab 5
28.00	4.50	24.00	28.00	40.00	13.00	Lab 6
23.00	4.50	25.00	27.00	34.00	13.00	Lab 7
27.00	6.00	26.00	30.00	38.00	15.00	Lab 8
26.00	4.50	25.00	29.00	37.00	13.00	Lab 9
26.00	5.00	25.00	30.00	38.00	14.00	Lab 10
26.00	4.50	25.20	28.80	36.80	14.00	Lab 11
24.00	4.60	24.50	28.30	36.50	13.30	Lab 12
19.00	5.00	20.00	29.00	30.00	14.00	Lab 13
24.00	4.10	25.00	28.50	36.50	13.20	Lab 14
26.50	4.80	24.50	29.60	37.60	14.10	Lab 16
29.00	5.20	30.00	30.00	40.00	13.40	Lab 18

25.61	4.59	24.78	29.08	37.30	13.63	Avg (Adjusted)
1.05	0.30	0.77	0.74	0.69	0.49	Std.devs

25.79	4.82	25.00	29.06	37.14	13.73	Avg (All labs)
1.62	0.61	0.81	0.97	1.18	0.62	Std.devs

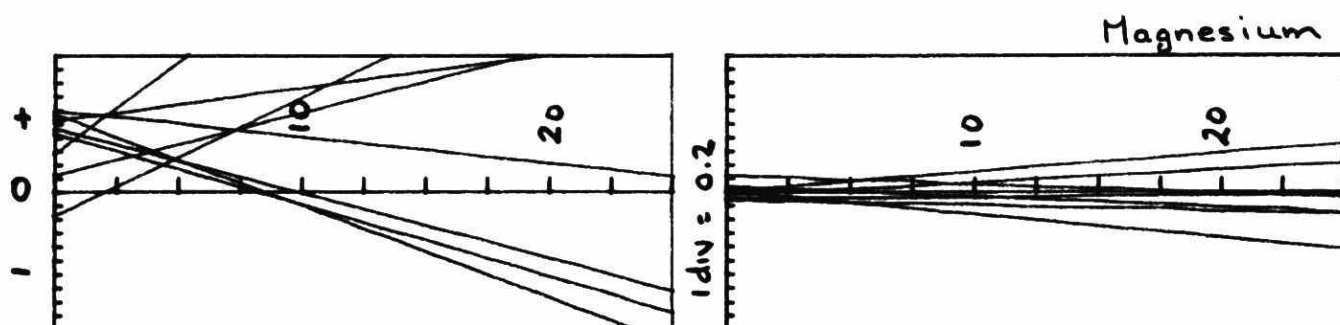
25.00	4.50	24.78	28.78	37.28	13.63	Expected
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PLUARG Minerals III (Oct 76): Magnesium

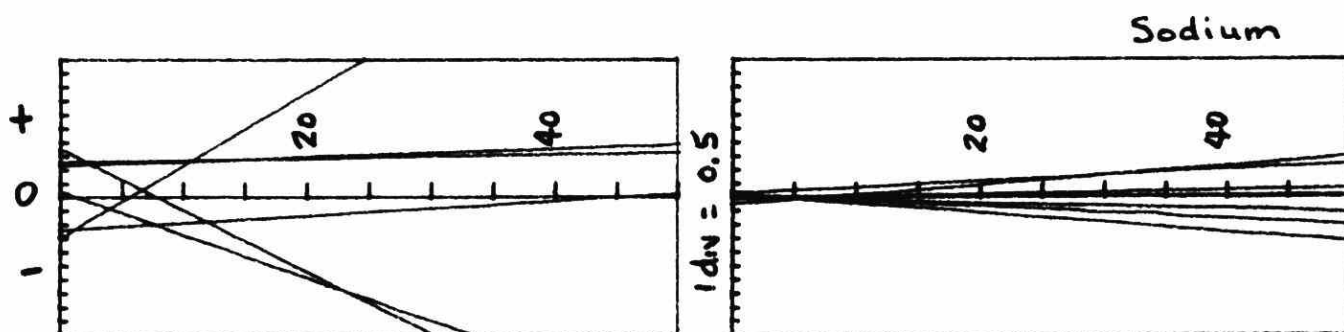
Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
* 2	0.37	-0.61	19.57	0.94	* 2	0.34	-0.34	21.61	0.96
* 3	0.51	0.94	-18.05	-0.83	* 3	0.51	1.12	-16.58	-0.86
* 4	0.52	0.70	-13.07	-0.74	* 4	0.71	0.92	-11.86	-0.66
5	0.22	-0.34	-2.72	-0.54	5	0.08	-0.12	-1.01	-0.55
6	0.20	-0.00	9.70	0.93	* 6	0.33	0.26	11.42	0.87
7	0.24	-0.26	0.60	0.13	7	0.08	-0.03	2.38	0.84
8	0.36	0.77	4.82	0.28	* 8	1.02	1.05	6.05	0.29
9	0.17	-0.32	-3.61	-0.73	9	0.15	0.00	-4.22	-0.81
* 10	0.35	0.65	-14.53	-0.91	* 10	0.31	0.85	-13.04	-0.91
11	0.21	0.02	-3.27	-0.62	11	0.15	0.24	-1.61	-0.48
12	0.11	-0.32	-1.31	-0.54	12	0.09	-0.10	0.35	0.19
13	0.46	0.95	-6.14	-0.58	* 13	0.58	1.18	-4.81	-0.40
14	0.21	-0.13	-3.65	-0.57	14	0.04	0.03	-1.96	-0.93
16	0.41	-0.18	1.57	0.20	16	0.25	0.04	3.46	0.58
* 13	0.23	0.27	31.02	0.99	* 18	0.37	0.58	33.12	0.98
* 21	0.69	-0.00	0.00	0.00	* 21	0.25	0.00	-0.00	-0.00

15.30	2.50	3.00	9.70	15.30	3.00	Lab 2
11.00	3.00	7.00	9.00	12.00	3.00	Lab 3
11.00	3.00	7.00	9.00	13.00	3.00	Lab 4
12.50	2.10	5.50	8.50	12.50	2.60	Lab 5
14.00	2.50	7.70	10.00	14.90	3.60	Lab 6
13.00	2.20	6.90	8.90	13.00	2.80	Lab 7
14.00	4.00	(13.00)	9.00	16.00	4.00	Lab 8
12.00	2.10	5.40	8.60	-	2.60	Lab 9
12.00	3.00	7.00	8.00	12.00	3.00	Lab 10
12.50	2.40	7.10	8.90	12.90	2.80	Lab 11
12.50	2.20	6.70	8.60	12.90	2.60	Lab 12
12.50	2.90	7.50	9.70	14.00	4.20	Lab 13
12.50	2.30	6.70	8.70	12.60	2.70	Lab 14
13.50	2.45	7.00	9.00	13.00	2.80	Lab 16
17.00	3.40	10.00	12.00	18.00	4.20	Lab 18
12.64	2.25	6.76	8.74	12.82	2.70	Avg (Adjusted)
0.43	0.14	0.26	0.19	0.21	0.10	Std.devs
12.90	2.52	7.05	8.99	13.53	3.07	Avg (All labs)
0.70	0.57	0.53	0.49	1.20	0.62	Std.devs
12.50	2.25	6.76	8.76	13.01	2.70	Expected



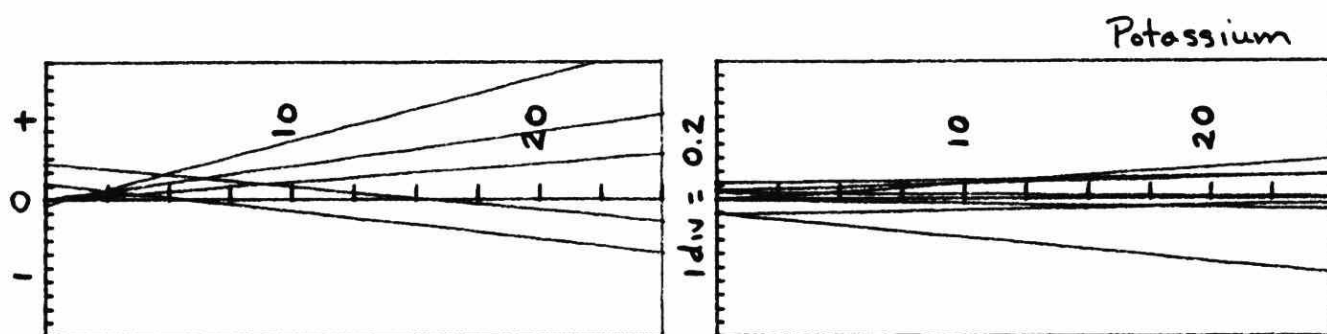
PLUARG Minerals III (Oct 76): Sodium

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
2	0.29	0.05	1.64	0.51	2	0.31	0.18	2.15	0.59
* 3	1.44	-1.59	25.54	0.89	* 3	1.36	-1.44	26.25	0.90
4	0.29	-1.33	2.20	0.63	* 4	0.36	-1.20	2.70	0.62
5	0.34	-0.17	-1.57	-0.44	5	0.26	-0.05	-1.05	-0.40
6	0.59	1.05	1.10	0.20	* 6	0.67	1.19	1.56	0.24
7	0.48	-0.16	-0.27	-0.06	7	0.54	-0.03	0.21	0.04
* 8	2.67	0.05	-15.97	-0.54	* 8	2.68	0.16	-15.58	-0.53
9	0.27	-0.04	-3.92	-0.84	9	0.26	0.09	-3.43	-0.82
10	1.28	-0.36	2.96	0.24	10	1.23	-0.23	3.54	0.29
11	0.23	1.18	0.24	0.11	* 11	0.25	1.31	0.74	0.30
12	0.32	-0.05	-2.71	-0.67	12	0.33	0.07	-2.22	-0.58
* 13	0.97	1.62	-22.61	-0.93	* 13	1.01	1.72	-22.26	-0.92
14	0.36	-0.17	0.31	0.09	14	0.42	-0.03	0.80	0.20
* 21	0.86	0.00	0.00	0.00	* 21	0.60	0.00	-0.00	-0.00
28.00	5.90	10.40	17.80	24.20	4.50	Lab 2			
35.00	5.00	11.00	20.00	26.00	5.20	Lab 3			
27.00	5.00	9.00	16.00	23.00	3.00	Lab 4			
27.50	5.40	9.80	17.00	22.50	4.40	Lab 5			
28.70	6.90	10.70	18.30	25.70	6.00	Lab 6			
27.00	5.70	10.00	17.00	24.00	4.10	Lab 7			
20.00	3.90	9.20	17.40	22.00	2.60	Lab 8			
26.90	5.40	10.00	16.10	22.50	4.40	Lab 9			
30.00	6.00	10.00	17.00	22.00	4.50	Lab 10			
29.40	7.20	11.20	18.10	24.60	5.80	Lab 11			
26.70	5.50	9.70	17.10	23.00	4.30	Lab 12			
22.30	5.70	10.10	14.20	21.20	5.10	Lab 13			
27.40	5.50	10.00	16.90	24.00	4.50	Lab 14			
27.64	5.63	9.99	16.99	23.17	4.39	Avg (Adjusted)			
1.13	0.24	0.22	0.49	0.89	0.15	Std.devs			
27.86	5.85	10.08	17.13	23.55	4.55	Avg (All labs)			
1.14	0.69	0.59	0.76	1.14	0.84	Std.devs			
28.00	5.60	9.99	16.99	23.99	4.39	Expected			



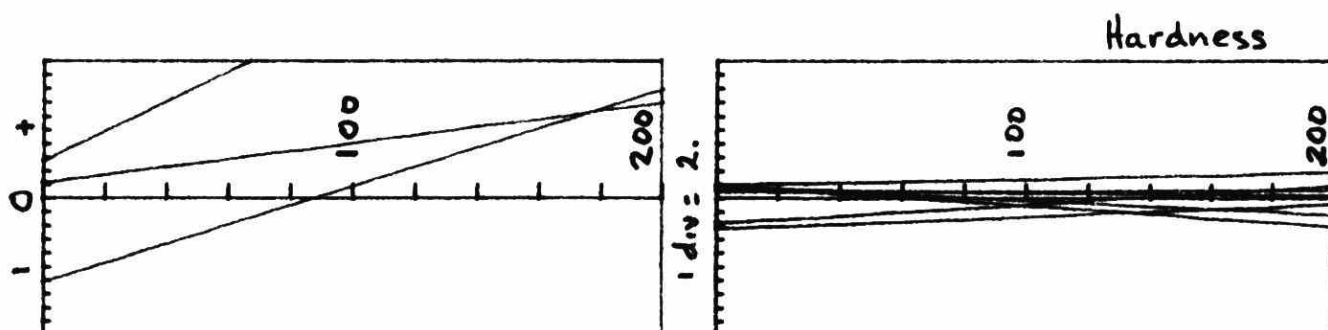
PLUARG Minerals III (Oct 76): Potassium

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
* 1	0.350	-0.147	11.65	0.93	* 1	0.345	-0.070	11.68	0.93
2	0.211	-0.286	-4.46	-0.85	2	0.183	-0.222	-4.43	-0.88
4	0.248	-0.296	0.83	0.25	4	0.226	-0.228	0.86	0.28
5	0.164	-0.076	2.99	0.82	5	0.141	-0.006	3.01	0.86
6	0.267	-0.082	-0.84	-0.24	6	0.272	-0.014	-0.82	-0.23
7	0.166	0.166	0.65	0.29	7	0.187	0.235	0.66	0.27
8	0.108	-0.061	6.19	0.98	* 8	0.119	0.012	6.21	0.97
10	0.167	0.071	1.15	0.47	10	0.190	0.140	1.16	0.43
11	0.411	-0.069	3.35	0.53	* 11	0.394	0.001	3.38	0.55
12	0.121	0.025	-0.47	-0.29	12	0.137	0.094	-0.45	-0.25
13	0.327	0.452	-4.29	-0.71	* 13	0.349	0.519	-4.28	-0.69
14	0.277	0.158	-5.11	-0.82	* 14	0.298	0.224	-5.10	-0.80
* 21	0.394	-0.000	0.00	0.00	* 21	0.342	0.000	-0.00	-0.00
21.000	4.350	1.650	6.150	11.500	0.065	Lab	1		
17.900	3.200	1.000	5.200	9.600	0.400	Lab	2		
18.900	3.500	1.000	5.300	10.200	0.500	Lab	4		
19.500	3.900	1.250	5.950	10.500	0.500	Lab	5		
18.700	4.000	1.000	6.000	10.000	0.300	Lab	6		
19.000	4.000	1.300	6.200	11.000	0.600	Lab	7		
20.000	4.200	1.200	6.200	11.000	0.400	Lab	8		
19.000	4.000	1.200	6.000	11.000	0.530	Lab	10		
19.800	4.100	1.200	5.750	10.200	0.740	Lab	11		
18.700	3.800	1.200	5.900	10.700	0.500	Lab	12		
18.200	4.100	1.400	6.300	11.000	0.800	Lab	13		
17.800	3.800	1.200	5.800	10.600	0.500	Lab	14		
18.814	3.771	1.136	5.793	10.429	0.476	Avg (Adjusted)			
0.485	0.309	0.131	0.383	0.525	0.097	Std.devs			
18.864	3.873	1.177	5.873	10.527	0.525	Avg (All labs)			
0.719	0.294	0.129	0.352	0.478	0.146	Std.devs			
19.500	3.900	1.136	6.016	10.886	0.476	Expected			



PLUARG Minerals III (Oct 76): Hardness as CaCO₃

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
* 2	3.6	-12.5	13.24	0.88	* 2	3.6	-12.2	14.07	0.89
3	1.9	0.7	-0.53	-0.14	3	2.0	1.0	0.19	0.05
4	0.7	1.8	0.18	0.13	4	0.3	2.0	0.92	0.83
5	1.9	-4.7	1.12	0.29	5	1.9	-4.4	1.86	0.45
7	1.0	1.0	-1.24	-0.52	7	0.8	1.3	-0.50	-0.30
8	2.8	2.0	5.11	0.69	* 8	3.2	2.4	5.83	0.68
9	2.2	-3.9	2.03	0.43	9	2.0	-3.6	2.79	0.57
10	2.0	1.5	-2.87	-0.59	10	2.1	1.8	-2.17	-0.46
11	1.1	1.6	-3.79	-0.88	11	1.0	1.9	-3.08	-0.85
* 18	5.8	5.2	20.69	0.88	* 18	5.9	5.6	21.55	0.88
* 21	3.6	0.0	0.00	0.00	* 21	2.3	-0.0	0.00	0.00
123.0	17.0	86.0	109.0	154.0	39.0	Lab 2			
114.0	26.0	90.0	110.0	148.0	46.0	Lab 3			
118.0	25.0	93.0	111.0	148.0	49.0	Lab 4			
114.0	20.0	84.0	105.0	144.0	43.0	Lab 5			
115.0	24.0	92.0	109.0	145.0	47.0	Lab 7			
122.0	28.0	98.0	112.0	160.0	52.0	Lab 8			
118.0	20.0	88.0	106.0	144.0	44.0	Lab 9			
112.0	23.0	93.0	106.0	144.0	48.0	Lab 10			
113.0	23.0	90.0	106.0	142.0	48.0	Lab 11			
149.0	32.7	123.0	129.0	180.0	60.2	Lab 18			
114.9	23.0	90.0	107.6	145.0	46.4	Avg (Adjusted)			
2.3	2.3	3.2	2.4	2.2	2.2	Std.devs			
115.8	23.6	91.0	108.1	146.9	47.1	Avg (All labs)			
3.3	2.8	4.1	2.7	5.7	2.9	Std.devs			
114.2	20.6	90.0	108.3	147.5	46.4	Expected			



PLUARG Minerals III (Oct 76): Alkalinity as CaCO₃

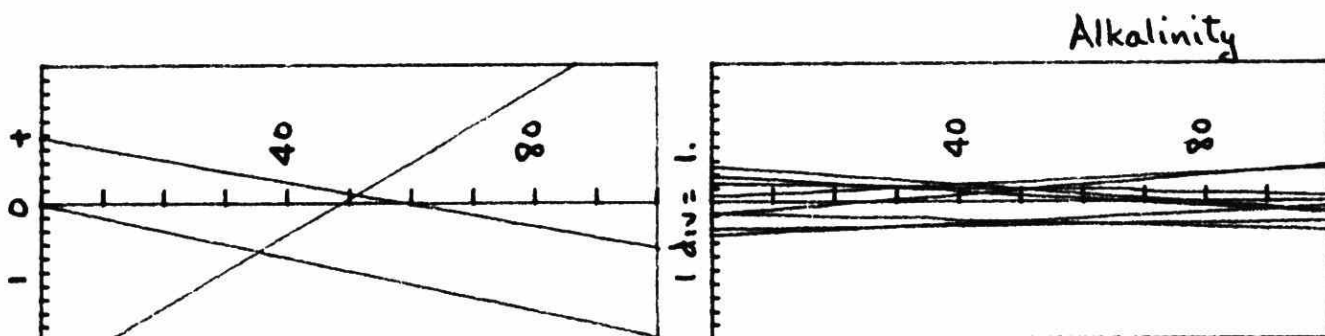
Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
2	0.36	-1.33	5.45	0.95	2	0.40	-0.85	3.56	0.88
3	1.15	4.29	-6.43	-0.75	* 3	1.21	4.73	-8.12	-0.81
4	0.40	0.86	0.89	0.41	4	0.34	1.32	-0.91	-0.47
5	0.32	0.00	3.89	0.93	5	0.25	0.48	2.04	0.86
7	0.58	1.35	-0.95	-0.31	7	0.62	1.81	-2.73	-0.67
9	0.14	2.10	-1.61	-0.92	9	0.10	2.56	-3.37	-0.99
10	0.24	-2.47	2.45	0.89	10	0.29	-2.00	0.62	0.39
11	0.73	-0.56	-8.11	-0.91	* 11	0.70	-0.14	-9.74	-0.94
12	0.30	-2.90	3.95	0.93	12	0.34	-2.43	2.09	0.78
14	0.62	-1.34	0.48	0.15	14	0.54	-0.89	-1.31	-0.44
* 18	2.79	-13.52	28.96	0.94	* 18	2.82	-12.86	26.45	-0.93
* 21	2.15	0.00	0.00	0.00	* 21	1.34	0.00	0.00	0.00

67.00	65.00	59.00	30.00	Lab 2
64.00	64.00	58.00	32.00	Lab 3
67.00	64.00	58.00	31.00	Lab 4
68.00	65.00	59.00	31.00	Lab 5
66.00	64.00	57.00	31.00	Lab 7
66.20	63.80	58.20	31.40	Lab 9
64.00	62.00	56.00	28.00	Lab 10
60.00	57.00	51.00	27.00	Lab 11
64.50	62.50	56.50	28.00	Lab 12
64.60	61.10	56.00	28.60	Lab 14
68.80	(6.6)	62.00	24.40	Lab 18

65.91 63.43 57.46 29.88 Avg (Adjusted)
1.42 1.42 1.25 1.45 Std.devs

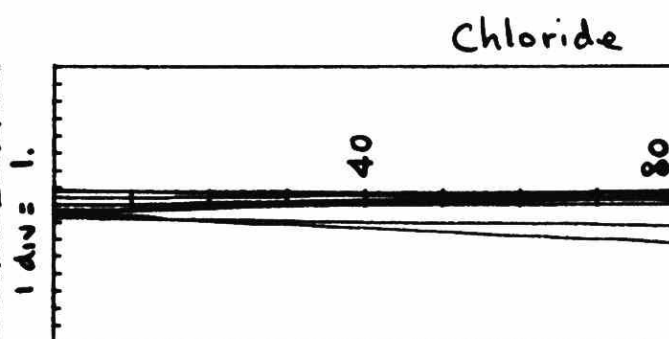
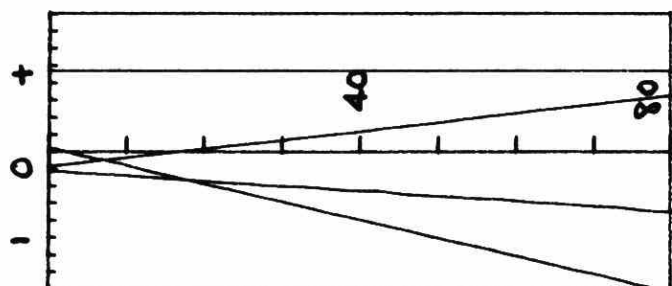
65.13 62.84 56.87 29.80 Avg (All labs)
2.28 2.41 2.35 1.75 Std.devs

65.90 63.40 57.50 29.90 Expected



PLUARG Minerals III (Oct 76): Chloride

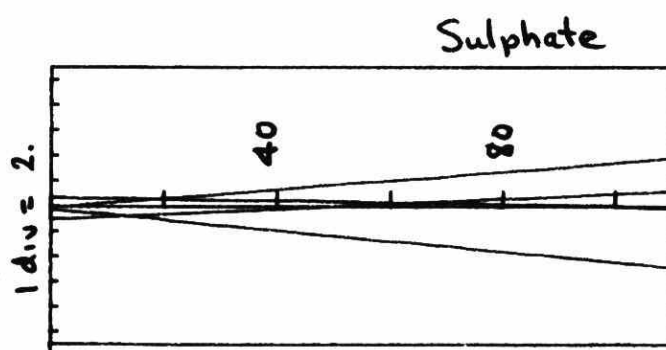
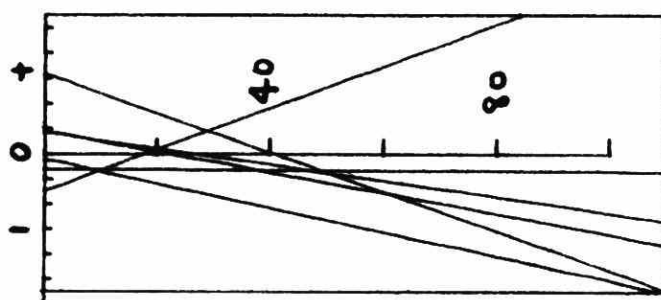
Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
2	0.98	0.63	-1.09	-0.30	2	0.81	0.87	-0.88	-0.29
* 3	4.21	11.38	-3.85	-0.25	* 3	4.19	11.62	-3.65	-0.24
4	0.35	0.56	-0.40	-0.30	4	0.45	0.81	-0.21	-0.13
5	0.51	-0.56	0.72	0.36	5	0.66	-0.31	0.91	0.36
7	1.66	-1.07	5.00	0.64	* 7	1.81	-0.80	5.17	0.62
8	0.29	-0.75	1.53	0.83	8	0.30	-0.49	1.73	0.85
9	0.39	-0.26	0.57	0.37	9	0.26	-0.01	0.77	0.64
10	0.50	-0.77	-2.40	-0.80	10	0.50	-0.53	-2.21	-0.77
11	1.11	-1.41	-3.16	-0.62	* 11	1.25	-1.17	-2.99	-0.56
* 12	0.36	-0.04	-10.66	-0.99	* 12	0.33	0.18	-10.48	-0.99
13	1.22	4.46	-0.25	-0.06	* 13	1.16	4.71	-0.04	-0.01
14	0.63	0.17	0.34	0.15	14	0.80	0.42	0.52	0.18
* 15	29.96	18.13	34.49	0.31	* 15	29.86	18.37	35.03	0.31
18	1.43	-1.00	-0.85	-0.16	18	1.28	-0.76	-0.63	-0.14
* 21	1.92	0.00	-0.00	-0.00	* 21	0.96	0.00	0.00	0.00
72.00	15.00	18.00	31.00	55.00	11.00	Lab	2		
80.00	28.00	32.00	42.00	64.00	15.00	Lab	3		
73.00	14.00	19.00	32.00	54.00	11.00	Lab	4		
73.00	13.00	17.50	31.50	53.00	10.50	Lab	5		
77.00	13.00	20.00	31.00	53.00	10.00	Lab	7		
73.00	13.00	18.00	31.00	54.00	10.00	Lab	8		
73.00	14.00	18.00	30.50	54.00	10.50	Lab	9		
70.00	12.00	17.00	30.00	52.00	10.00	Lab	10		
70.00	11.10	15.80	29.30	49.20	10.20	Lab	11		
65.00	12.70	16.00	27.80	48.00	9.30	Lab	12		
76.00	18.40	22.10	36.70	59.20	14.30	Lab	13		
74.00	13.80	19.00	31.20	53.00	11.10	Lab	14		
83.60	21.60	53.60	80.30	127.00	12.20	Lab	15		
71.20	13.30	17.10	27.40	53.40	10.30	Lab	18		
72.40	13.51	17.95	30.58	53.55	10.55	Avg (Adjusted)			
1.27	0.90	0.76	1.42	0.91	0.44	Std.devs			
72.93	13.69	18.32	31.05	53.62	10.81	Avg (All labs)			
2.20	1.88	1.69	2.25	2.38	1.23	Std.devs			
74.50	13.70	17.95	31.45	55.15	10.55	Expected			



PLUARG Minerals III (Oct 76): Sulphate as SO4

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
4	2.39	1.64	-5.76	-0.68	* 4	2.12	1.79	-8.26	-0.84
5	1.48	1.48	-3.81	-0.71	* 5	1.70	1.66	-6.43	-0.83
7	2.30	0.53	1.99	0.32	7	1.41	0.67	-0.66	-0.18
* 8	5.81	6.34	-13.64	-0.70	* 8	5.17	6.30	-15.64	-0.79
9	1.73	-0.46	-1.59	-0.33	9	1.18	-0.31	-4.19	-0.82
10	3.33	-1.48	2.78	0.31	* 10	4.20	-1.20	-0.19	-0.02
11	1.16	-1.25	5.00	0.86	11	1.85	-1.03	2.10	0.41
12	1.05	0.52	1.93	0.58	12	0.65	0.69	-0.80	-0.44
14	1.31	-0.19	6.37	0.88	14	0.54	-0.02	3.54	0.93
* 15	2.54	-2.33	15.44	0.43	* 15	2.19	-2.86	-16.47	0.51
18	4.04	-0.78	-6.90	-0.55	* 18	4.84	-0.50	-9.66	-0.62
* 21	2.96	0.00	-0.00	-0.00	* 21	1.84	0.00	0.00	0.00

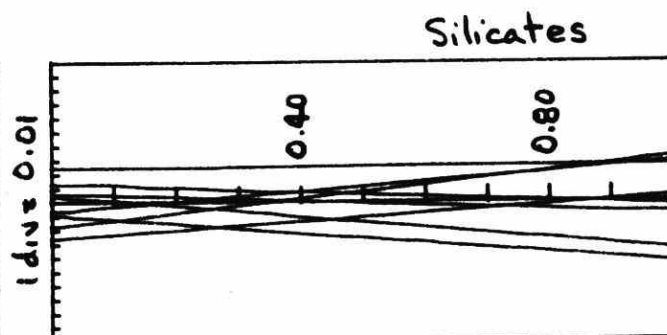
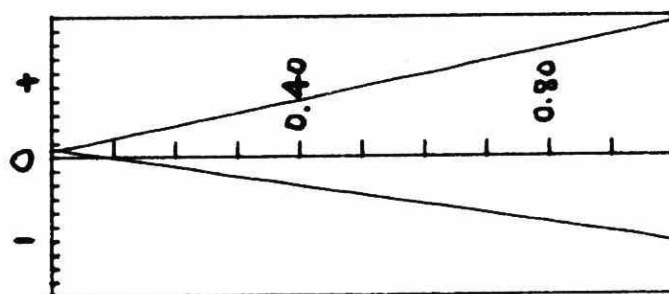
92.00	18.00	20.00	40.00	69.00	10.00	Lab 4
95.00	19.50	19.50	41.00	68.00	10.00	Lab 5
100.00	20.00	21.00	37.00	73.00	11.00	Lab 7
86.00	22.00	—	41.00	73.00	12.00	Lab 8
95.00	18.50	17.00	38.00	69.00	9.50	Lab 9
103.00	20.00	19.00	39.00	63.00	8.00	Lab 10
103.00	20.00	20.00	39.00	69.00	8.00	Lab 11
100.00	19.80	19.60	40.20	71.50	10.70	Lab 12
104.00	19.60	20.70	39.60	74.00	10.90	Lab 14
>40.	21.50	18.50	>40.	>40.	8.80	Lab 15
95.00	16.00	19.20	36.00	56.00	9.40	Lab 18
100.40	19.58	19.66	38.76	71.30	10.02	Avg (Adjusted)
3.51	0.63	1.59	1.28	2.28	1.28	Std.devs
98.56	19.04	19.56	38.87	68.06	9.72	Avg (All labs)
4.39	1.35	1.16	1.61	5.54	1.13	Std.devs
104.20	19.80	19.66	41.26	71.76	10.02	Expected



PLUARG Minerals III (Oct 76): Reactive Silicates as Si

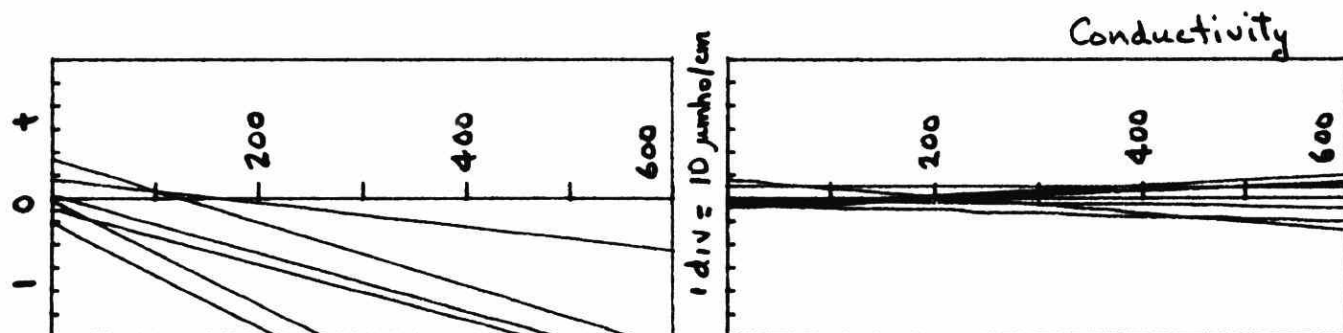
Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
4	0.020	-0.025	2.97	0.65	4	0.020	-0.025	2.97	0.65
5	0.014	-0.006	3.57	0.80	5	0.014	-0.006	3.57	0.80
7	0.007	0.013	-1.64	-0.76	7	0.007	0.013	-1.64	-0.76
8	0.011	-0.017	5.01	0.92	8	0.011	-0.017	5.01	0.92
9	0.018	0.025	0.23	0.07	9	0.018	0.025	0.23	0.07
10	0.017	0.006	-1.59	-0.44	10	0.017	0.006	-1.59	-0.44
* 11	0.023	0.005	9.12	0.90	* 11	0.023	0.005	9.12	0.90
12	0.010	0.004	-3.87	-0.89	12	0.010	0.004	-3.87	-0.89
13	0.017	-0.010	-3.42	-0.71	13	0.017	-0.010	-3.42	-0.71
* 14	0.006	0.005	-6.71	-0.98	* 14	0.006	0.005	-6.71	-0.98
* 21	0.025	-0.000	0.00	0.00	* 21	0.025	-0.000	0.00	0.00
0.100	—	0.950	0.950	—	0.150	Lab 4			
0.100	0.020	0.950	1.000	1.000	0.200	Lab 5			
0.120	0.040	0.940	0.940	0.980	0.200	Lab 7			
0.080	0.020	0.980	0.980	1.000	0.190	Lab 8			
0.150	0.050	0.950	1.000	1.000	0.200	Lab 9			
0.110	0.030	0.950	0.920	0.970	0.200	Lab 10			
0.110	0.065	1.050	1.050	1.050	0.190	Lab 11			
0.098	0.037	0.920	0.920	0.930	0.190	Lab 12			
0.084	0.023	0.870	0.920	0.950	0.180	Lab 13			
0.100	0.030	0.880	0.900	0.910	0.190	Lab 14			
0.105	0.031	0.939	0.954	0.976	0.189	Avg (Adjusted)			
0.022	0.011	0.032	0.035	0.028	0.017	Std.devs			
0.105	0.031	0.939	0.954	0.976	0.189	Avg (All labs)			
0.022	0.011	0.032	0.035	0.028	0.017	Std.devs			
0.110	0.030	0.960	0.960	0.960	0.189	Expected			

Lab 13 - reported results as SiO₂
- data above corrected to Si units



PLUARG Minerals III (Oct 76): Conductivity

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
1	1.6	-2.1	2.54	0.95	1	2.7	-0.9	-0.63	-0.43
* 2	1.1	-2.4	-19.94	-1.00	* 2	1.4	-1.5	-22.42	-1.00
3	9.0	6.7	-2.12	-0.42	* 3	9.7	8.0	-5.17	-0.73
* 4	5.9	15.7	-10.98	-0.96	* 4	6.5	16.8	-13.75	-0.97
5	4.0	6.5	-0.56	-0.26	5	4.5	7.7	-3.64	-0.85
6	2.0	-0.3	-9.74	-0.99	* 6	1.3	0.8	-12.53	-1.00
8	5.8	-5.3	5.16	0.87	8	4.6	-4.0	1.92	0.64
9	2.3	4.1	3.08	0.93	9	2.3	5.4	-0.11	-0.09
10	1.7	-5.6	-9.30	-1.00	* 10	2.6	-5.1	-12.02	-1.00
11	3.1	-4.6	1.96	0.77	11	2.3	-3.3	-1.19	-0.72
12	4.2	-4.1	5.42	0.93	12	2.6	-2.8	2.18	0.86
13	1.5	-3.3	4.72	0.99	13	1.1	-2.0	1.48	0.94
* 18	10.6	-12.3	-19.95	-0.96	* 18	10.3	-11.3	-22.41	-0.97
* 21	18.3	0.0	-0.00	-0.00	* 21	5.9	-0.0	0.00	0.00
550.0	114.0	232.0	322.0	451.0	120.0	Lab	1		
430.0	88.0	180.0	250.0	350.0	94.0	Lab	2		
525.0	117.0	225.0	320.0	450.0	123.0	Lab	3		
490.0	116.0	215.0	300.0	415.0	122.0	Lab	4		
540.0	120.0	230.0	320.0	450.0	126.0	Lab	5		
439.0	102.0	205.0	284.0	395.0	109.0	Lab	6		
570.0	118.0	235.0	323.0	450.0	120.0	Lab	8		
560.0	124.0	237.0	329.0	460.0	126.0	Lab	9		
483.0	99.0	—	279.0	396.0	101.0	Lab	10		
550.0	112.0	229.0	315.0	440.0	118.0	Lab	11		
570.0	119.0	233.0	327.0	455.0	123.0	Lab	12		
564.0	117.0	235.0	324.0	457.0	122.0	Lab	13		
420.0	78.0	160.0	230.0	350.0	95.0	Lab	18		
557.7	117.7	233.1	322.9	452.0	122.1	Avg (Adjusted)			
11.4	3.9	3.0	4.6	6.6	3.1	Std.devs			
540.1	114.2	229.1	314.3	440.5	118.8	Avg (All labs)			
31.7	7.9	9.8	17.8	24.3	7.9	Std.devs			
558.0	118.0	235.0	318.0	430.0	115.0	Expected			



PLUARG Nutrients III (Oct 76): Total Phosphorus as P

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
* 3	0.0054-0.0042	13.20	0.72		* 3	0.0065-0.0038	12.52	0.64	
4	0.0018-0.0020	2.53	0.52		4	0.0010-0.0018	2.26	0.69	
* 5	0.0235 0.0010	1.77	0.03		* 5	0.0221 0.0011	1.79	0.04	
6	0.0068 0.0160	-7.74	-0.44		* 6	0.0070 0.0162	-8.13	-0.45	
7	0.0060-0.0113	8.80	0.56		* 7	0.0072-0.0105	7.82	0.46	
8	0.0017-0.0002	-5.33	-0.80		* 8	0.0015 0.0000	-5.61	-0.85	
9	0.0073 0.0021	3.31	0.19		9	0.0063 0.0021	3.34	0.22	
10	0.0017-0.0001	-3.68	-0.68		10	0.0016 0.0001	-3.97	-0.74	
11	0.0038-0.0028	4.20	0.43		11	0.0039-0.0026	3.85	0.39	
12	0.0021-0.0018	-2.86	-0.50		12	0.0027-0.0016	-3.24	-0.46	
13	0.0029 0.0011	4.18	0.53		13	0.0034 0.0013	3.76	0.43	
14	0.0050-0.0064	5.07	0.40		* 14	0.0061-0.0059	4.40	0.30	
* 15	0.0159-0.0449	67.08	0.87		* 15	0.0151-0.0448	66.94	0.88	
16	0.0029 0.0023	-5.70	-0.64		16	0.0029 0.0024	-6.00	-0.66	
* 17	0.0088-0.0063	12.52	0.52		* 17	0.0091-0.0056	11.65	0.48	
* 18	0.0082 0.0078	-12.12	-0.53		* 18	0.0083 0.0080	-12.45	-0.54	
* 21	0.0060 0.0000	-0.00	-0.00		* 21	0.0044 0.0000	-0.00	-0.00	

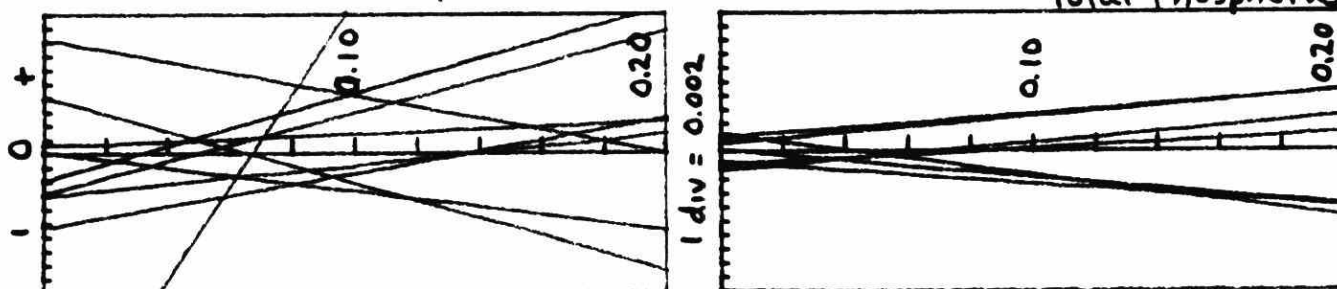
0.1330	0.0420	0.0270	0.0500	0.1200	0.0630	Lab 3	reported 0.63 #6
0.1290	0.0400	0.0300	0.0500	0.1030	0.0530	Lab 4	
0.1470	(.098)	(.082)	0.0650	0.0820	0.0520	Lab 5	
0.1330	0.0460	0.0460	0.0600	0.1100	0.0760	Lab 6	
0.1200	—	0.0200	0.0460	0.1100	0.0450	Lab 7	
0.1200	0.0390	0.0270	0.0510	0.0970	0.0500	Lab 8	
0.1400	0.0500	0.0330	0.0500	0.1000	0.0600	Lab 9	
0.1220	0.0390	0.0280	0.0520	0.0990	0.0510	Lab 10	
0.1280	0.0410	0.0280	0.0550	0.1070	0.0480	Lab 11	
0.1200	0.0380	0.0270	0.0450	0.1000	0.0540	Lab 12	
0.1320	0.0420	0.0310	0.0530	0.1090	0.0630	Lab 13	
0.1200	0.0350	0.0220	0.0500	0.1100	0.0520	Lab 14	
0.1700	0.0400	0.0100	0.0400	0.1300	0.0200	Lab 15	
0.1210	0.0420	0.0300	0.0540	0.1010	0.0490	Lab 16	
0.1340	0.0340	(.144)	0.0640	0.1120	0.0490	Lab 17	
0.1200	0.0400	0.0300	0.0500	0.0940	0.0700	Lab 18	

0.1274 0.0417 0.0296 0.0513 0.1027 0.0540 Avg (Adjusted)
0.0072 0.0039 0.0021 0.0034 0.0039 0.0056 Std.devs

0.1259 0.0412 0.0293 0.0515 0.1042 0.0546 Avg (All labs)
0.0069 0.0042 0.0067 0.0042 0.0051 0.0088 Std.devs

0.1250 0.0375 0.0296 0.0546 0.1046 0.0540 Expected

Lab 5 may have reported as PO₄ (not P); data above 'corrected'
Total Phosphorus



PLUARG Nutrients III (Oct 76): Filtered Total Phosphorus

Dev'n from overall averages
lab $s_{D.X}$ a_D $b_D\%$ r_D

* 3 0.0052 0.0159 -31.93 -0.95
4 0.0052-0.0026 1.28 0.11
* 6 0.0036 0.0181 -9.12 -0.77
7 0.0026-0.0039 7.43 0.30
8 0.0017 0.0014 -4.99 -0.31
9 0.0050 0.0012 7.27 0.56
10 0.0017 0.0028 -8.76 -0.92
11 0.0034 0.0008 0.24 0.03
12 0.0039-0.0035 -5.40 -0.53
13 0.0034 0.0040 2.95 0.38

Dev'n from 'adjusted' avg.
lab $s_{D.X}$ a_D $b_D\%$ r_D

* 3 0.0046 0.0156 -30.29 -0.95
4 0.0048-0.0027 2.54 0.24
* 6 0.0038 0.0179 -7.21 -0.66
* 7 0.0036-0.0038 8.54 0.73
8 0.0017 0.0014 -3.88 -0.73
* 9 0.0061 0.0013 8.26 0.53
* 10 0.0019 0.0028 -7.71 -0.88
11 0.0040 0.0009 1.31 0.15
12 0.0036-0.0036 -4.23 -0.47
13 0.0025 0.0040 4.26 0.61

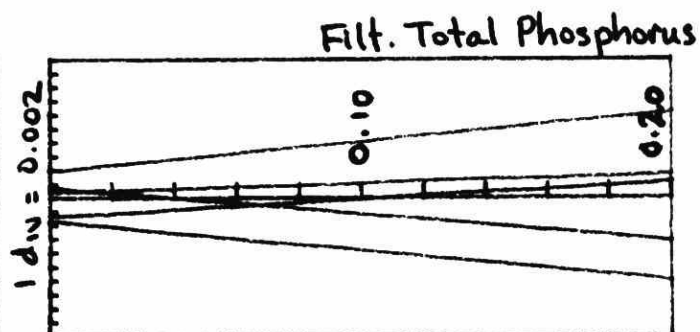
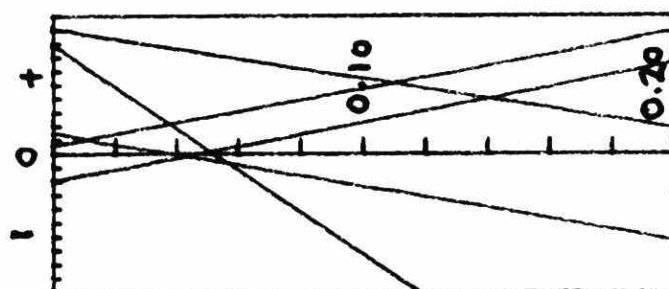
* 21 0.0054 0.0000 0.00 0.00 * 21 0.0053 0.0000 0.00 0.00

0.1000 0.0400 0.0260 0.0500 (.056) 0.0390 Lab 3
0.1200 0.0400 0.0220 0.0350 0.1000 0.0250 Lab 4
0.1320 0.0510 0.0430 0.0570 (.140) 0.0420 Lab 6
0.1300 0.0430 0.0210 0.0440 0.0970 0.0210 Lab 7
0.1200 0.0390 0.0210 0.0440 0.0910 0.0290 Lab 8
0.1400 0.0460 0.0280 0.0460 0.0960 0.0300 Lab 9
0.1150 0.0390 0.0240 0.0450 0.0910 0.0250 Lab 10
0.1280 0.0390 0.0230 0.0490 0.0920 0.0280 Lab 11
0.1100 0.0380 0.0150 0.0400 0.0910 0.0190 Lab 12
0.1310 0.0410 0.0260 0.0510 0.1040 0.0350 Lab 13

0.1218 0.0394 0.0214 0.0438 0.0956 0.0272 Avg (Adjusted)
0.0082 0.0011 0.0040 0.0065 0.0060 0.0058 Std. devs

0.1243 0.0406 0.0225 0.0443 0.0953 0.0265 Avg (All labs)
0.0098 0.0027 0.0039 0.0050 0.0049 0.0051 Std. devs

0.1250 0.0375 0.0214 0.0464 0.0964 0.0272 Expected



PLUARG Nutrients III (Oct 76): Filtered Reactive Phosphates

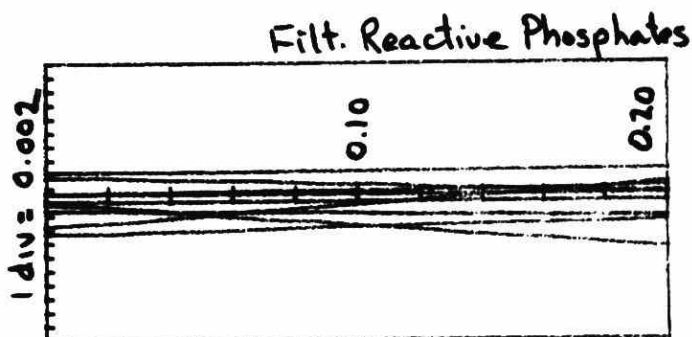
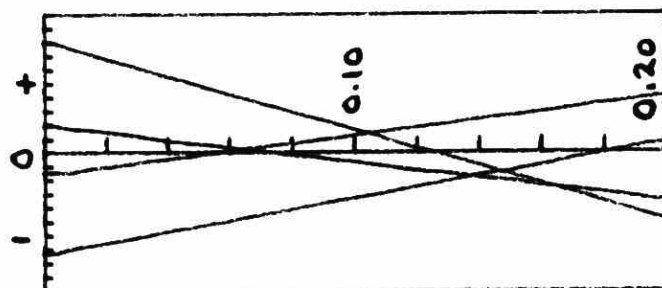
Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
3	0.0027	0.0038	-5.54	-0.70	* 3	0.0028	0.0039	-5.52	-0.69
4	0.0023-0.0015		-0.49	-0.10	4	0.0025-0.0014		-0.48	-0.09
7	0.0029-0.0032		5.73	0.69	* 7	0.0030-0.0031		5.74	0.68
* 8	0.0027-0.0014		7.60	1.00	* 8	0.0028-0.0014		8.00	1.00
9	0.0011	0.0042	0.19	0.08	9	0.0012	0.0042	0.20	0.08
10	0.0044	0.0010	-0.07	-0.01	10	0.0043	0.0010	-0.03	-0.00
11	0.0024	0.0034	-1.18	-0.23	11	0.0023	0.0035	-1.15	-0.23
* 12	0.0053	0.0159	-13.00	-0.80	* 12	0.0051	0.0160	-12.98	-0.81
13	0.0034	0.0012	0.51	0.07	13	0.0035	0.0012	0.50	0.07
14	0.0019-0.0004		-3.25	-0.63	14	0.0019-0.0004		-3.23	-0.62
16	0.0037-0.0036		3.14	0.37	16	0.0036-0.0036		3.18	0.38
18	0.0034-0.0048		0.97	0.13	18	0.0033-0.0047		1.01	0.15
* 21	0.0037	0.0000	0.00	0.00	* 21	0.0038	0.0000	0.00	0.00

0.1220	0.0390	0.0160	0.0400	0.0870	0.0300	Lab 3	
0.1250	0.0380	0.0140	0.0360	0.0830	0.0230	Lab 4	
0.1300	0.0390	0.0160	0.0390	0.0880	0.0170	Lab 7	
0.1200	0.0280	(.057)	(.079)	(.122)	(.077)	Lab 8	Blank ?
0.1300	0.0440	0.0200	0.0440	0.0910	0.0260	Lab 9	
0.1220	0.0370	0.0170	0.0390	0.0960	0.0240	Lab 10	
0.1250	0.0400	0.0180	0.0450	0.0930	0.0250	Lab 11	
0.1200	—	0.0280	0.0480	0.1000	0.0360	Lab 12	
0.1300	0.0390	0.0170	0.0400	0.0850	0.0270	Lab 13	
0.1200	0.0350	0.0140	0.0370	0.0860	0.0240	Lab 14	
0.1240	0.0420	0.0110	0.0390	0.0870	0.0150	Lab 16	
0.1200	0.0400	0.0060	0.0360	0.0840	0.0180	Lab 18	

0.1245 0.0394 0.0146 0.0395 0.0881 0.0228 Avg (Adjusted)
 0.0039 0.0028 0.0045 0.0034 0.0047 0.0041 Std.devs

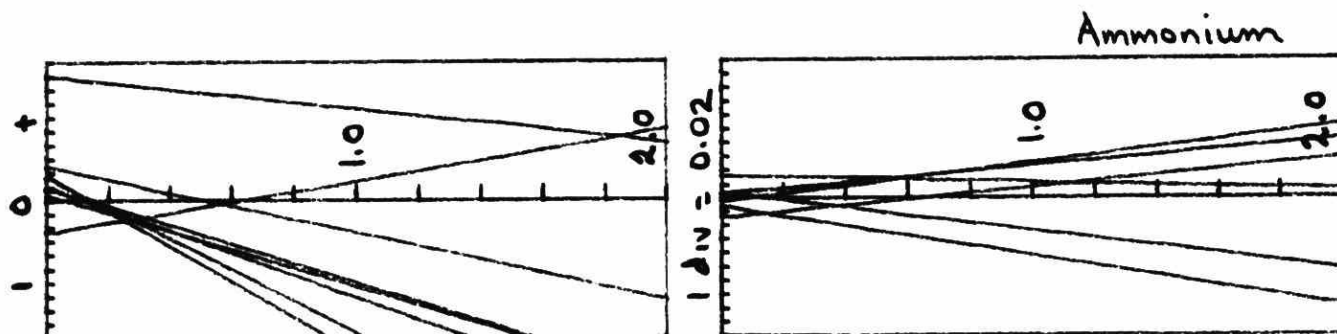
0.1248 0.0393 0.0149 0.0395 0.0880 0.0229 Avg (All labs)
 0.0040 0.0025 0.0040 0.0030 0.0041 0.0048 Std.devs

0.1250 0.0375 0.0146 0.0396 0.0896 0.0228 Expected



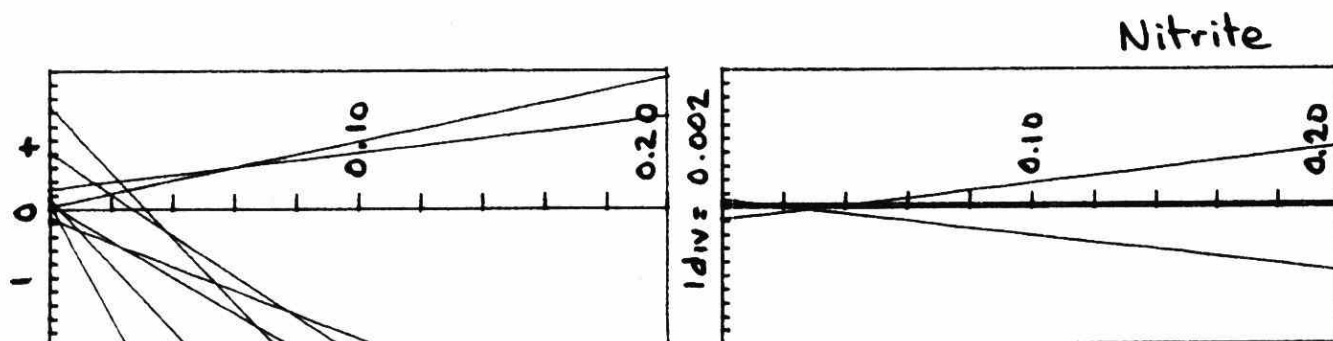
PLUARG Nutrients III (Oct 76): Ammonium as N

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
1	0.048	0.006	6.93	0.57	1	0.042	0.008	3.91	0.42
* 2	0.055	0.177	-2.07	-0.18	* 2	0.052	0.179	-4.87	-0.42
3	0.023	-0.007	8.78	0.88	3	0.028	-0.004	5.53	0.69
4	0.021	0.005	-2.80	-0.54	4	0.016	0.007	-5.62	-0.86
* 5	0.000	0.000	0.00	0.00	* 5	0.000	0.000	0.00	0.00
6	0.022	0.015	-11.31	-0.93	* 6	0.028	0.018	-13.98	-0.93
7	0.018	-0.030	7.42	0.89	7	0.011	-0.027	4.30	0.89
8	0.028	-0.050	10.89	0.88	* 8	0.037	-0.047	7.52	0.71
* 9	0.035	0.025	-21.33	-0.89	* 9	0.036	0.033	-25.60	-0.92
10	0.010	0.004	-10.74	-0.98	* 10	0.015	0.006	-13.39	-0.98
11	0.016	0.045	-6.91	-0.90	* 11	0.024	0.048	-9.72	-0.90
* 12	0.032	0.032	-20.48	-0.95	* 12	0.029	0.033	-22.76	-0.97
13	0.030	0.029	2.00	0.30	13	0.026	0.031	-0.95	-0.18
* 14	0.014	0.015	-13.49	-0.98	* 14	0.020	0.017	-16.08	-0.97
18	0.033	-0.017	-4.27	-0.53	18	0.038	-0.014	-7.17	-0.68
* 21	0.052	0.000	0.00	0.00	* 21	0.045	-0.000	0.00	0.00
1.310	0.390	0.150	0.310	0.970	0.280	Lab	1		
1.370	0.620	0.220	0.530	1.010	0.400	Lab	2		
1.360	0.430	0.120	0.370	0.880	0.230	Lab	3		
1.200	0.380	0.094	0.340	0.840	0.240	Lab	4		
1.5	0.5	1.0	0.5	1.3	0.5	Lab	5		
1.140	0.340	0.150	0.290	0.740	0.230	Lab	6		
1.300	0.390	0.100	0.300	0.890	0.230	Lab	7		
1.360	0.380	0.078	0.330	0.830	0.220	Lab	8		
0.88	0.330	0.074	0.300	0.670	0.250	Lab	9		
1.120	0.330	0.110	0.310	0.750	0.220	Lab	10		
1.220	0.400	0.150	0.370	0.800	0.270	Lab	11		
1.000	0.310	0.120	0.320	0.740	0.210	Lab	12		
1.280	0.390	0.130	0.380	0.920	0.290	Lab	13		
1.100	0.330	0.110	0.320	0.730	0.230	Lab	14		
1.200	0.390	0.100	0.290	0.740	0.200	Lab	18		
1.275	0.395	0.116	0.332	0.873	0.245	Avg (Adjusted)			
0.064	0.018	0.022	0.038	0.078	0.034	Std.devs			
1.249	0.382	0.118	0.329	0.836	0.241	Avg (All labs)			
0.086	0.029	0.026	0.034	0.080	0.029	Std.devs			
1.250	0.375	0.116	0.366	0.866	0.245	Expected			



PLUARG Nutrients III (Oct 76): Nitrite

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
* 3	0.0013	0.0002	-42.77	-0.96	* 3	0.0018	0.0007	-47.45	-0.94
* 4	0.0030	0.0002	-24.83	-0.64	* 4	0.0021	0.0003	-26.30	-0.79
7	0.0035	-0.0010	8.05	0.22	7	0.0023	-0.0008	5.27	0.24
9	0.0012	-0.0000	0.91	0.07	9	0.0016	0.0005	-5.28	-0.32
10	0.0029	-0.0009	-15.38	-0.46	* 10	0.0020	0.0007	-17.53	-0.67
11	0.0038	0.0001	12.38	0.30	* 11	0.0026	0.0003	9.30	0.34
* 12	0.0106	0.0080	-52.41	-0.44	* 12	0.0102	0.0073	-47.19	-0.44
13	0.0004	-0.0003	6.30	0.81	13	0.0010	0.0003	0.00	0.00
* 14	0.0030	0.0004	15.98	0.47	* 14	0.0043	0.0015	5.25	0.12
* 17	0.0009	0.0000	-78.25	-0.99	* 17	0.0011	0.0003	-80.58	-0.99
18	0.0104	0.0021	-12.26	-0.12	* 18	0.0113	0.0040	-29.71	-0.26
* 21	0.0044	0.0000	-0.00	-0.00	* 21	0.0015	0.0000	-0.00	-0.00
0.0000	0.0000	0.0100	0.0100	0.0100	0.0100	Lab 3			
0.0000	0.0020	0.0150	0.0150	0.0150	0.0050	Lab 4			
0.0000	0.0000	0.0200	0.0200	0.0200	0.0070	Lab 7			
0.0000	0.0000	0.0190	0.0170	0.0180	0.0140	Lab 9			
0.0000	0.0000	0.0150	0.0160	0.0160	0.0050	Lab 10			
0.0015	0.0010	0.0210	0.0220	0.0230	0.0080	Lab 11			
0.0200	0.0000	0.0200	0.0200	0.0200	0.0000	Lab 12			
0.0000	0.0000	0.0180	0.0190	0.0200	0.0130	Lab 13			
0.0000	0.0000	0.0180	0.0200	0.0220	0.0210	Lab 14			
0.0000	0.0000	0.0030	0.0030	0.0050	0.0040	Lab 17			
0.0000	0.0000	0.0100	0.0120	0.0180	0.0320	Lab 18			
0.0000	0.0000	0.0190	0.0187	0.0193	0.0113	Avg (Adjusted)			
0.0000	0.0000	0.0010	0.0015	0.0012	0.0038	Std.devs			
0.0003	0.0002	0.0172	0.0177	0.0192	0.0132	Avg (All labs)			
0.0006	0.0004	0.0041	0.0035	0.0024	0.0099	Std.devs			
0.0000	0.0000	0.0190	0.0190	0.0190	0.0110	Expected			

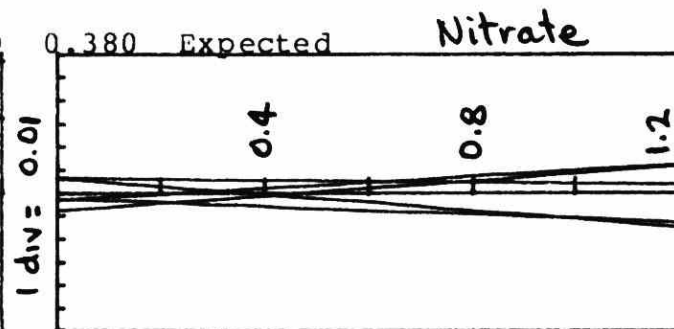
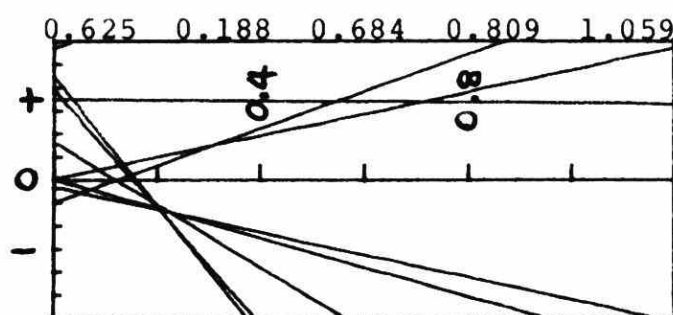


PLUARG Nutrients III (Oct 76): Nitrate (+ Nitrite) as N

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
1	0.070	-0.016	-9.31	-0.42	* 1	0.081	-0.007	-9.83	-0.38
2	0.040	0.063	-0.29	-0.02	* 2	0.052	0.070	-0.46	-0.03
3	0.020	-0.018	2.80	0.44	3	0.009	-0.015	3.25	0.76
4	0.021	0.009	-3.96	-0.55	4	0.017	0.013	-3.60	-0.58
* 5	0.000	0.000	0.00	0.00	* 5	0.000	0.000	0.00	0.00
* 6	0.238	0.105	16.78	0.19	* 6	0.240	0.115	16.45	0.19
7	0.026	-0.022	15.46	0.90	* 7	0.014	-0.019	16.00	0.97
8	0.012	-0.009	-2.05	-0.50	8	0.011	-0.006	-1.73	-0.47
9	0.014	-0.003	9.20	0.91	* 9	0.021	0.002	9.44	0.83
10	0.013	-0.009	2.20	0.50	10	0.008	-0.006	2.57	0.74
11	0.038	-0.003	-13.14	-0.77	* 11	0.034	-0.001	-12.73	-0.79
12	0.019	0.010	-0.91	-0.16	12	0.009	0.013	-0.48	-0.18
* 13	0.062	0.076	-50.80	-0.94	* 13	0.060	0.076	-50.41	-0.94
* 14	0.019	0.086	-56.03	-0.99	* 14	0.021	0.088	-55.96	-0.99
* 15	0.000	0.000	0.00	0.00	* 15	0.000	0.000	0.00	0.00
* 17	0.000	0.000	0.00	0.00	* 17	0.000	0.000	0.00	0.00
* 18	0.026	0.030	-27.54	-0.96	* 18	0.017	0.031	-27.08	-0.98
* 21	0.062	0.000	0.00	0.00	* 21	0.017	0.000	0.00	0.00

0.480	0.150	0.630	0.850	0.860	0.340	Lab 1
0.640	0.250	0.760	0.960	1.060	0.450	Lab 2
0.630	0.170	0.680	0.820	1.060	0.390	Lab 3
0.630	0.190	0.690	0.790	1.000	0.360	Lab 4
1.7	0.4	1.5	1.3	1.3	1.7	Lab 5
0.480	2.1	1.000	1.080	1.400	0.730	Lab 6
0.690	0.200	0.770	0.910	1.200	0.430	Lab 7
0.590	0.170	0.670	0.800	1.010	0.380	Lab 8
0.690	0.200	0.770	0.910	1.110	0.400	Lab 9
0.620	0.190	0.700	0.830	1.060	0.380	Lab 10
0.600	0.160	0.590	0.700	0.890	0.300	Lab 11
0.640	0.200	0.680	0.820	1.050	0.390	Lab 12
0.490	0.160	0.410	0.450	0.570	0.220	Lab 13
0.340	0.193	0.387	0.463	0.550	0.235	Lab 14
.45	.47	.36	.45	.47	.39	Lab 15
.86	.29	1.2	1.4	1.75	.98	Lab 17
0.500	0.160	0.520	0.600	0.800	0.320	Lab 18
0.622	0.184	0.684	0.812	1.036	0.380	Avg (Adjusted)
0.019	0.013	0.011	0.016	0.029	0.012	Std.devs
0.621	0.188	0.694	0.839	1.030	0.382	Avg (All labs)
0.059	0.028	0.059	0.074	0.099	0.043	Std.devs

results all equal?
?

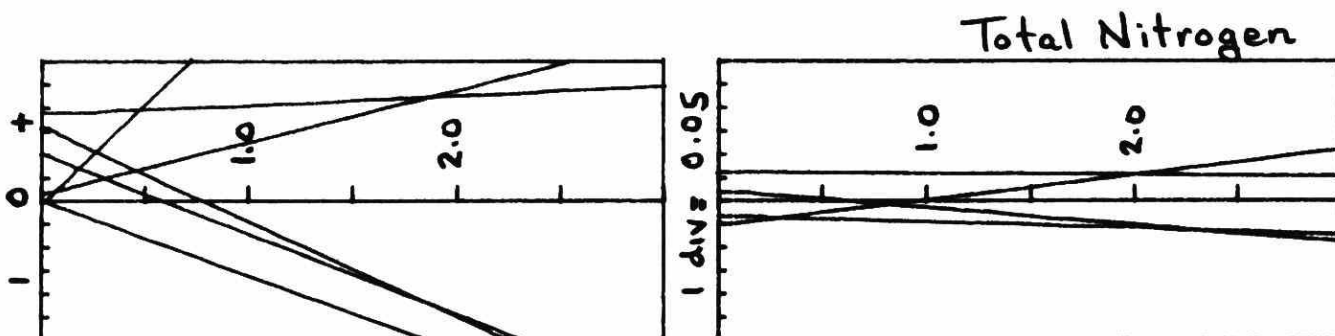


PLUARG Nutrients III (Oct 76): Total Nitrogen

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
* 2	0.106	0.451	-3.81	-0.25	* 2	0.108	0.485	-1.72	-0.11
3	0.100	0.150	0.11	0.01	* 3	0.114	0.188	2.03	0.12
4	0.063	0.032	-2.68	-0.29	* 4	0.046	0.062	-0.31	-0.05
* 5	0.000	0.000	0.000	0.000	* 5	0.000	0.000	0.000	0.000
7	0.081	-0.020	8.82	0.62	* 7	0.090	0.018	11.12	0.66
* 9	0.248	-0.046	38.74	0.75	* 9	0.243	-0.002	42.03	0.77
* 10	0.099	-0.031	-17.88	-0.79	* 10	0.102	-0.002	-16.13	-0.74
11	0.084	-0.062	-3.79	-0.31	11	0.068	-0.033	-1.38	-0.14
12	0.095	-0.089	3.41	0.25	12	0.109	-0.050	5.44	0.33
* 13	0.102	0.135	-22.44	-0.84	* 13	0.093	0.158	-20.47	-0.84
* 14	0.047	0.071	-19.05	-0.94	* 14	0.056	0.100	-17.35	-0.91
* 15	0.000	0.000	0.000	0.000	* 15	0.000	0.000	0.000	0.000
* 17	0.000	0.000	0.000	0.000	* 17	0.000	0.000	0.000	0.000
18	0.080	-0.011	-5.87	-0.47	18	0.079	0.021	-3.75	-0.31

* 21	0.128	-0.000	0.00	0.00	* 21	0.084	0.000	0.00	0.00
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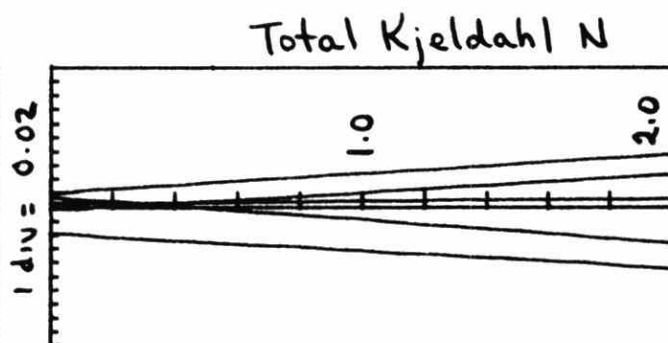
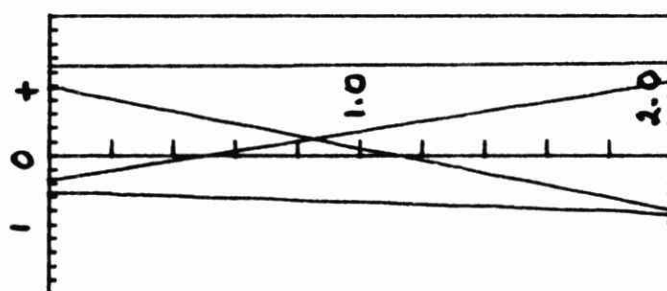
2.190	1.010	1.600	2.090	2.740	1.390	Lab 2
2.140	0.900	1.240	1.650	2.550	1.070	Lab 3
1.980	0.590	1.240	1.580	2.250	0.960	Lab 4
5.1	2.2	3.9	3.3	4.2	4.2	Lab 5
1.990	0.590	1.320	1.650	2.600	1.130	Lab 7
3.030	0.970	1.440	2.040	3.050	1.180	Lab 9
1.450	0.430	1.080	1.250	1.950	0.750	Lab 10
1.900	0.500	1.100	1.500	2.100	0.840	Lab 11
1.770	0.530	1.150	1.530	2.440	0.930	Lab 12
1.810	0.610	1.000	1.340	1.850	0.900	Lab 13
1.600	0.560	0.930	1.360	2.000	0.920	Lab 14
.48	2.54	.36	.45	1.65	.39	Lab 15
2.26	.66	1.48	2.43	2.68	2.18	Lab 17
1.920	0.560	1.060	1.350	2.180	1.000	Lab 18
1.893	0.545	1.138	1.490	2.243	0.945	Avg (Adjusted)
0.088	0.039	0.078	0.099	0.145	0.072	Std.devs
1.950	0.612	1.185	1.543	2.353	0.997	Avg (All labs)
0.122	0.145	0.098	0.113	0.206	0.099	Std.devs
1.875	0.553	1.138	1.513	2.263	0.945	Expected



PLUARC Nutrients III (Oct 76): Total 'Kjeldahl' Nitrogen as N

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D,X}	a _D	b _D %	r _D	lab	s _{D,X}	a _D	b _D %	r _D
* 2	0.052	0.360	-5.39	-0.42	* 2	0.062	0.364	-6.06	-0.40
* 3	0.134	0.127	0.67	0.02	* 3	0.134	0.128	0.29	0.01
4	0.038	0.015	-3.14	-0.35	4	0.025	0.014	-3.31	-0.51
* 5	0.000	0.000	0.00	0.00	* 5	0.000	0.000	0.00	0.00
7	0.059	0.003	1.15	0.09	7	0.070	0.006	0.42	0.03
9	0.091	0.000	2.44	0.12	9	0.078	-0.003	2.57	0.15
10	0.048	-0.038	-2.31	-0.21	10	0.039	-0.039	-2.48	-0.27
12	0.093	-0.059	-0.58	-0.03	* 12	0.105	-0.053	-1.59	-0.07
13	0.043	0.097	-8.60	-0.67	* 13	0.038	0.097	-8.84	-0.73
14	0.069	0.018	3.54	0.22	14	0.079	0.022	2.79	0.16
* 15	0.000	0.000	0.00	0.00	* 15	0.000	0.000	0.00	0.00
* 17	0.000	0.000	0.00	0.00	* 17	0.000	0.000	0.00	0.00
18	0.045	-0.035	7.50	0.60	* 18	0.047	-0.034	7.06	0.57
* 21	0.068	0.000	0.00	0.00	* 21	0.065	0.000	0.00	0.00

1.550	0.762	0.836	1.130	1.680	0.940	Lab 2
1.510	0.730	0.560	0.830	1.490	0.680	Lab 3
1.350	0.400	0.550	0.790	1.250	0.600	Lab 4
3.4	1.8	2.4	2.0	2.9	2.5	Lab 5
1.300	0.390	0.550	0.740	1.400	0.700	Lab 7
1.460	0.440	0.600	0.830	1.270	0.530	Lab 9
1.320	0.390	0.470	0.720	1.210	0.550	Lab 10
1.130	0.330	0.470	0.710	1.390	0.590	Lab 12
1.320	0.450	0.590	0.890	1.280	0.630	Lab 13
1.300	0.370	0.590	0.900	1.450	0.680	Lab 14
.03	2.07	0	0	1.18	0	Lab 15
1.4	.37	.28	1.03	.93	1.30	Lab 17
1.420	0.400	0.540	0.750	1.380	0.680	Lab 18
1.346	0.398	0.552	0.796	1.316	0.612	Avg (Adjusted)
0.067	0.026	0.051	0.072	0.103	0.076	Std.devs
1.325	0.396	0.545	0.791	1.329	0.620	Avg (All labs)
0.098	0.038	0.051	0.075	0.086	0.063	Std.devs
1.250	0.375	0.552	0.802	1.302	0.612	Expected



FLUARG Nutrients III (Oct 76): Ammonium + Nitrate

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	$s_{D.X}$	a_D	$b_D\%$	r_D	lab	$s_{D.X}$	a_D	$b_D\%$	r_D
1	0.026	0.019	-1.76	-0.40	1	0.022	0.004	0.94	0.26
* 2	0.071	0.307	-4.42	-0.38	* 2	0.069	0.292	-1.78	-0.16
3	0.024	-0.029	8.71	0.92	* 3	0.029	-0.045	11.64	0.93
4	0.014	0.007	-0.19	-0.09	4	0.013	-0.008	2.54	0.78
5	0.000	0.000	0.00	0.00	5	0.000	0.000	0.00	0.00
* 6	0.000	0.000	0.00	0.00	* 6	0.000	0.000	0.00	0.00
* 7	0.049	-0.027	12.58	0.86	* 7	0.045	-0.044	15.68	0.91
8	0.074	-0.084	10.39	0.67	* 8	0.081	-0.100	13.28	0.72
* 9	0.105	0.142	-14.80	-0.68	* 9	0.100	0.123	-12.34	-0.62
10	0.041	0.027	-4.01	-0.54	10	0.035	0.012	-1.34	-0.24
11	0.045	0.006	-4.66	-0.56	11	0.050	-0.007	-2.13	-0.26
12	0.070	0.054	-8.47	-0.62	* 12	0.064	0.039	-5.89	-0.50
* 13	0.142	-0.072	-9.01	-0.38	* 13	0.148	-0.083	-6.73	-0.28
* 14	0.118	0.112	-30.27	-0.86	* 14	0.121	0.102	-28.43	-0.83
* 18	0.087	-0.020	-11.73	-0.66	* 18	0.092	-0.032	-9.44	-0.55
* 21	0.066	-0.000	0.00	0.00	* 21	0.036	0.000	0.00	0.00

1.790	0.540	0.780	1.160	1.830	0.620	Lab	1
2.010	0.870	0.980	1.490	2.070	0.850	Lab	2
1.990	0.600	0.800	1.190	1.940	0.620	Lab	3
1.830	0.570	0.784	1.130	1.840	0.600	Lab	4

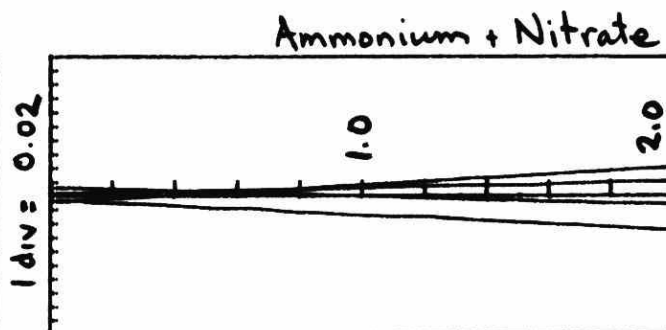
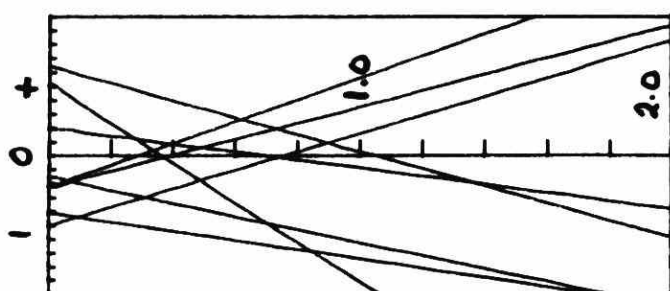
{ gross errors in NH_4 or NO_3 prevent calculation } Lab 5
Lab 6

1.990	0.590	0.870	1.210	2.090	0.660	Lab	7
2.050	0.550	0.748	1.130	1.840	0.600	Lab	8
1.570	0.530	0.844	1.210	1.780	0.650	Lab	9
1.740	0.520	0.810	1.140	1.810	0.600	Lab	10
1.820	0.560	0.740	1.070	1.690	0.570	Lab	11
1.640	0.510	0.800	1.140	1.790	0.600	Lab	12
1.770	0.550	0.540	0.830	1.490	0.510	Lab	13
1.440	0.523	0.497	0.830	1.390	0.680	Lab	14
1.700	0.550	0.620	0.890	1.540	0.520	Lab	18

1.795	0.548	0.779	1.125	1.793	0.598	Avg (Adjusted)	
0.040	0.022	0.029	0.039	0.069	0.021	Std.devs	

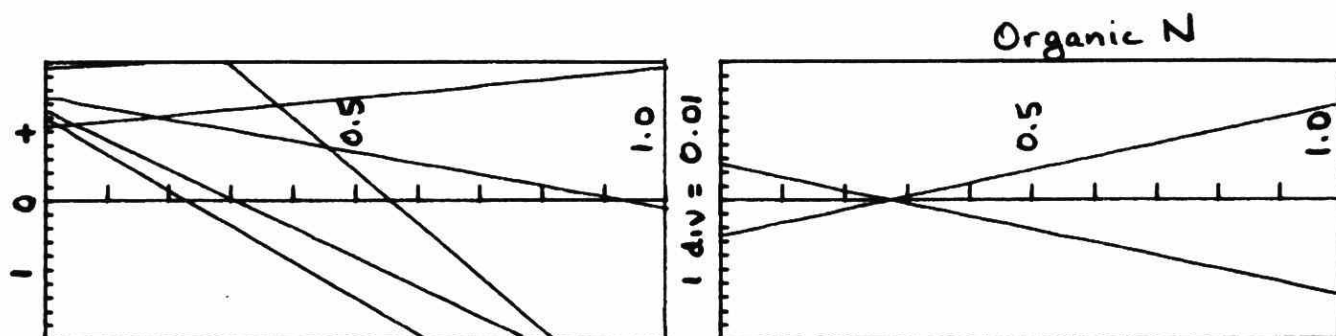
1.837	0.550	0.780	1.137	1.820	0.601	Avg (All labs)	
0.141	0.031	0.027	0.036	0.074	0.017	Std.devs	

1.875	0.563	0.779	1.154	1.904	0.598	Expected	
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PLUARG Nutrients III (Oct 76): Organic Nitrogen as N

Dev'n from overall averages					Dev'n from 'adjusted' avg.				
lab	s _{D.X}	a _D	b _D %	r _D	lab	s _{D.X}	a _D	b _D %	r _D
2	0.032	0.067	13.98	0.71	* 2	0.055	0.133	7.18	0.31
* 3	0.089	0.175	-34.76	-0.67	* 3	0.090	0.211	-33.07	-0.72
4	0.040	0.014	-15.64	-0.67	* 4	0.056	0.064	-21.15	-0.68
* 5	0.000	0.000	0.00	0.00	* 5	0.000	0.000	0.00	0.00
7	0.047	-0.086	14.52	0.59	7	0.044	-0.025	9.42	0.46
* 9	0.109	0.040	-5.99	-0.12	* 9	0.134	0.074	-8.06	-0.13
* 10	0.166	-0.039	19.06	0.26	* 10	0.199	0.053	4.31	0.05
12	0.033	0.007	-19.43	-0.81	* 12	0.060	0.059	-25.93	-0.73
13	0.073	-0.014	-3.34	-0.26	13	0.044	0.025	-9.42	-0.46
14	0.079	0.012	14.92	0.40	* 14	0.123	0.096	2.50	0.05
* 21	0.087	-0.000	0.00	0.00	* 21	0.045	0.000	0.00	0.00
0.180	0.140	0.650	0.600	0.670	0.540	Lab	2		
0.150	0.300	0.440	0.460	0.610	0.450	Lab	3		
0.150	0.020	0.450	0.450	0.410	0.360	Lab	4		
1.9	*	1.4	*	1.6		Lab	5		
0.000	0.000	0.450	0.440	0.510	0.470	Lab	7		
(0.58)	0.110	0.530	0.530	0.600	0.280	Lab	9		
0.130	0.035	0.610	0.530	0.740	0.200	Lab	10		
0.130	0.020	0.350	0.390	0.450	0.380	Lab	12		
0.040	0.065	0.460	0.510	0.360	0.390	Lab	13		
0.200	0.040	0.480	0.580	0.720	0.450	Lab	14		
0.020	0.033	0.455	0.475	0.435	0.430	Avg (Adjusted)			
0.028	0.046	0.007	0.049	0.106	0.057	Std.devs			
0.117	0.048	0.473	0.495	0.520	0.432	Avg (All labs)			
0.080	0.050	0.098	0.083	0.145	0.068	Std.devs			
0.000	0.000	0.450	0.450	0.450	0.450	Expected			



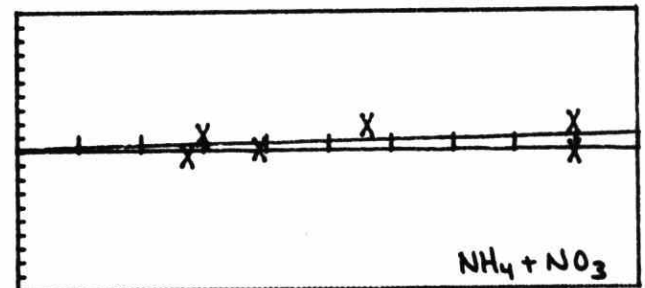
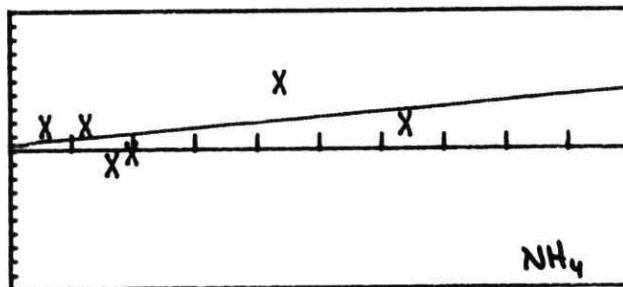
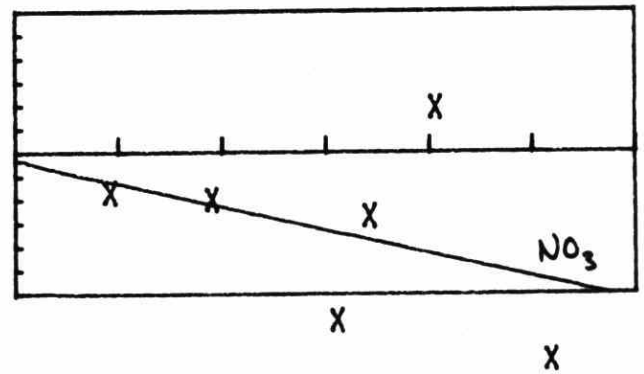
Appendix II

Diagrams, comparable to figures 1 and 2, were produced for each participant for each parameter. These show the fit of his data to the statistically calculated line, and permit him/her to assess the validity of the line. (In a few cases the position of the line has been affected by one of the reported values).

The tables associated with appendix II repeat the linear equations for each participant by parameter. One has the choice of rejecting the line $D = a_D + b_DX$ with standard deviation $s_{D \cdot X}$ in favour of the simple average deviation \bar{D} and its standard deviation s_D , as noted earlier.

Nutrients III

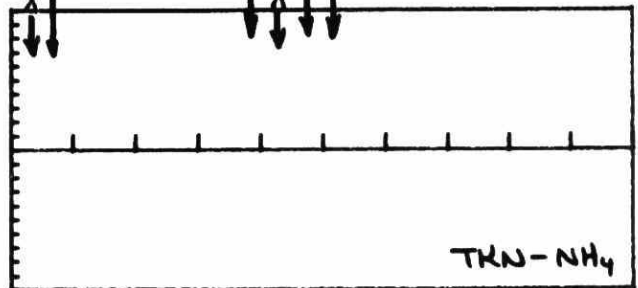
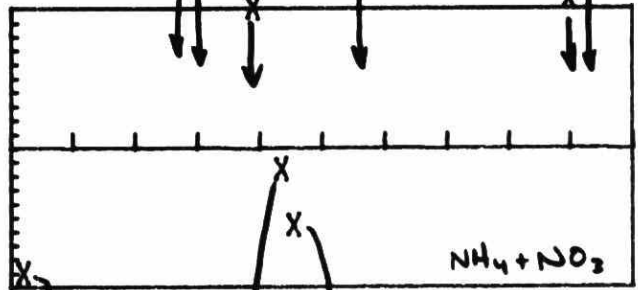
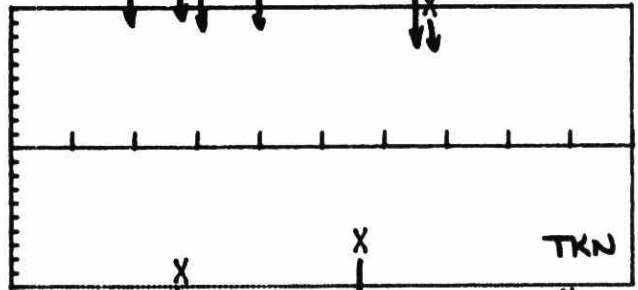
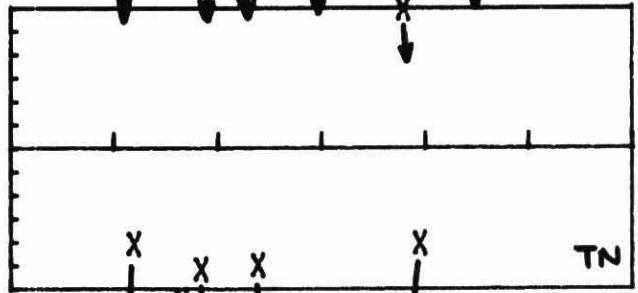
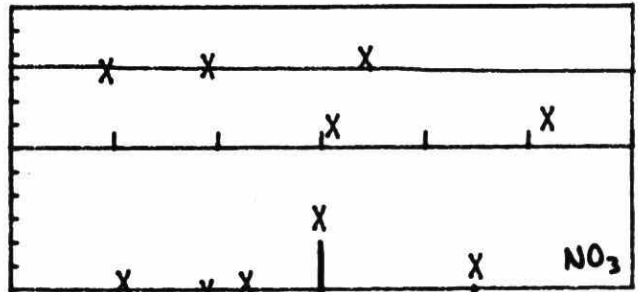
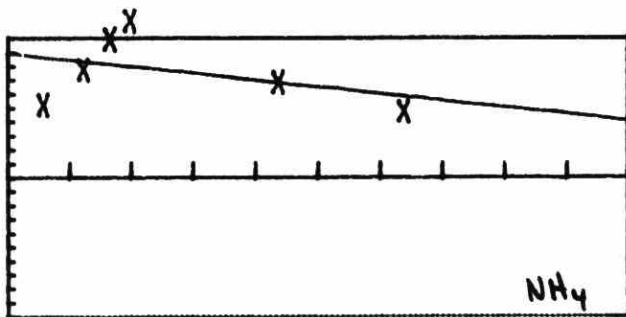
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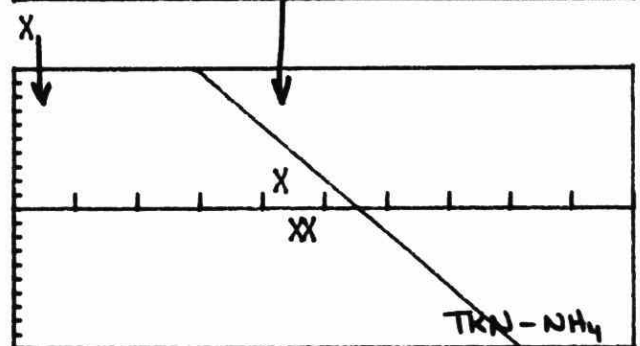
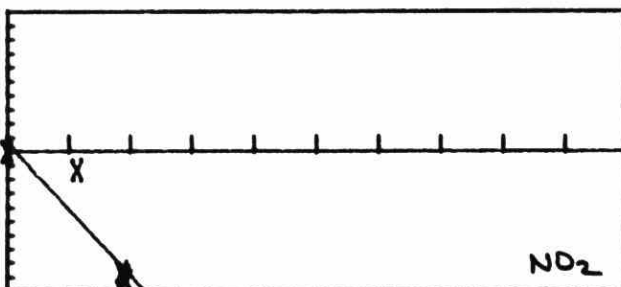
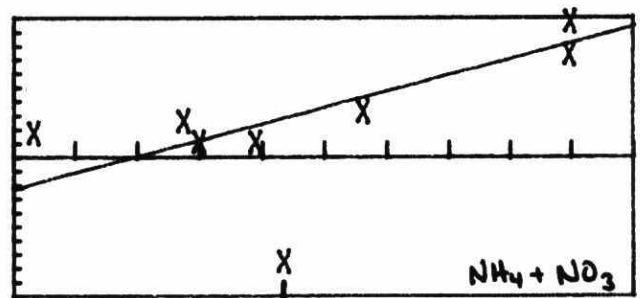
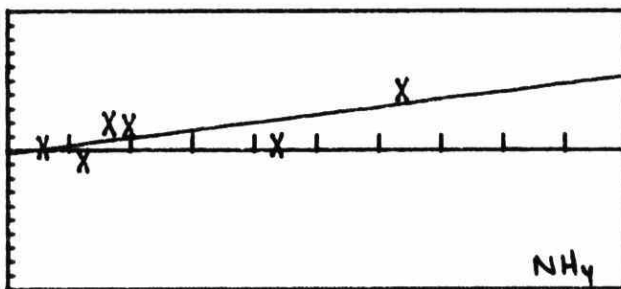
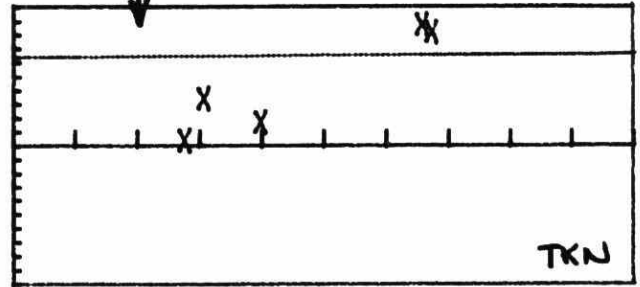
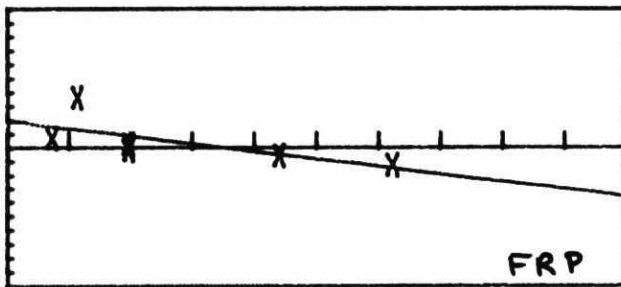
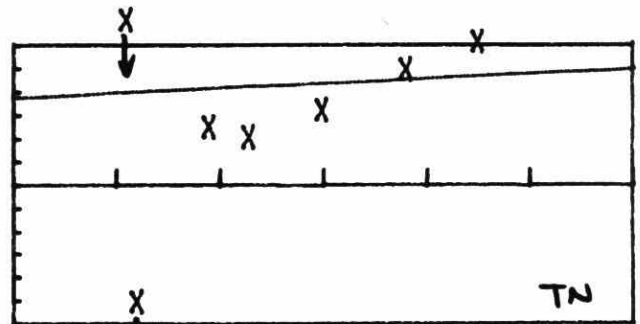
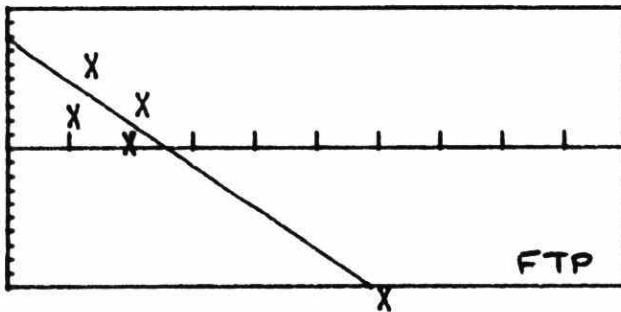
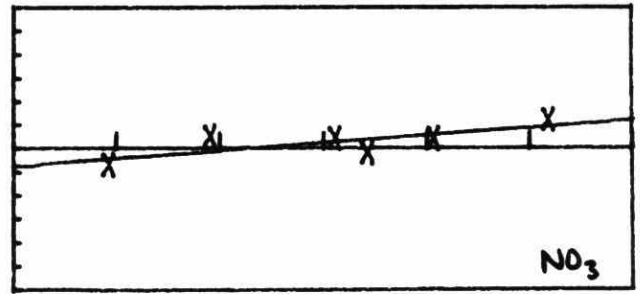
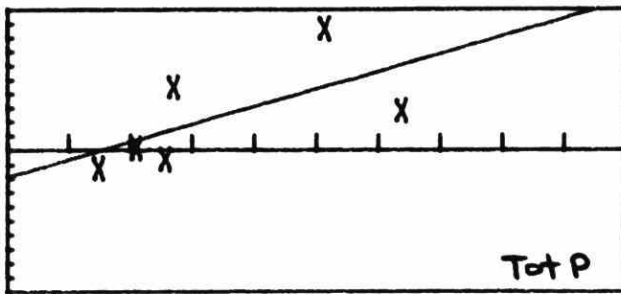
Nutrients III

LAB 2.

X

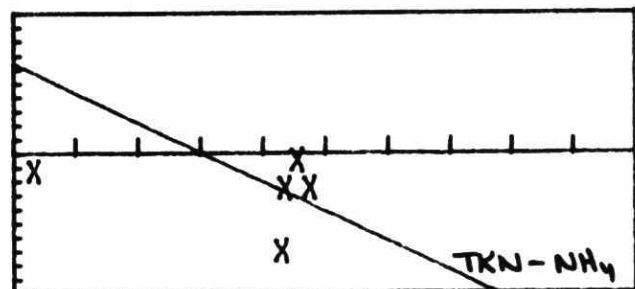
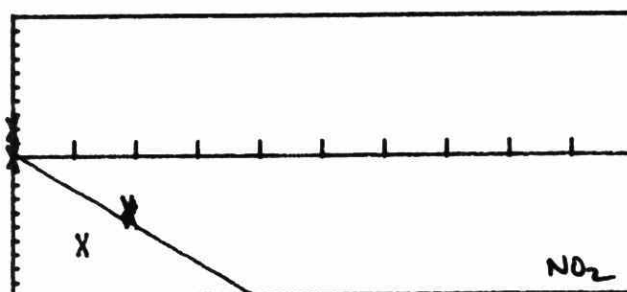
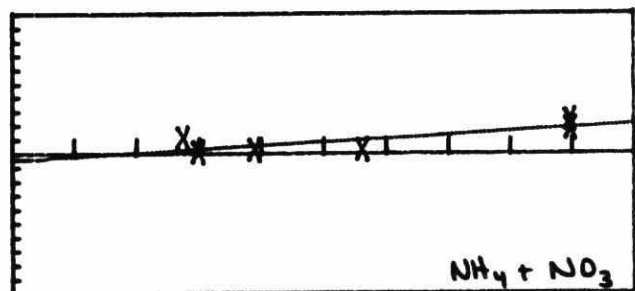
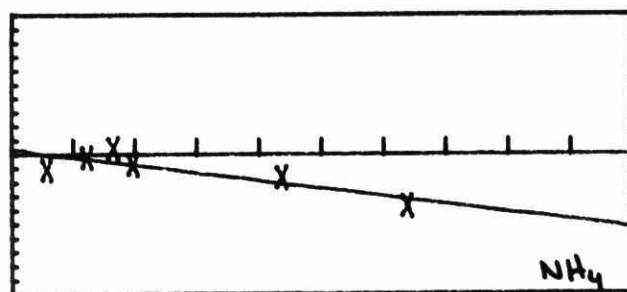
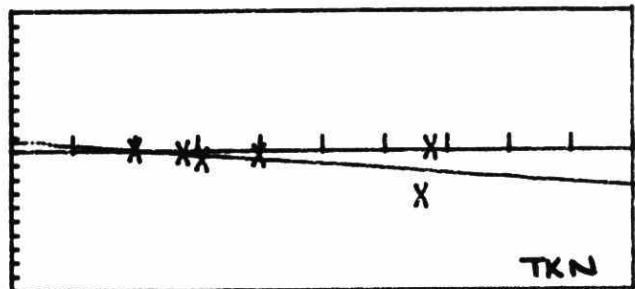
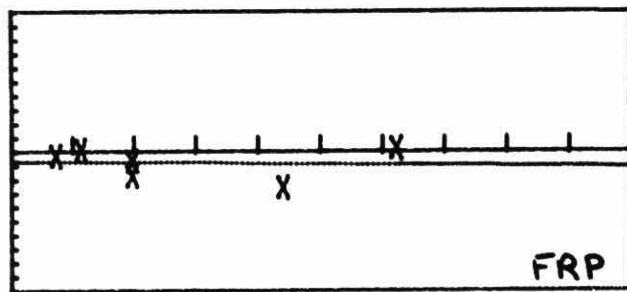
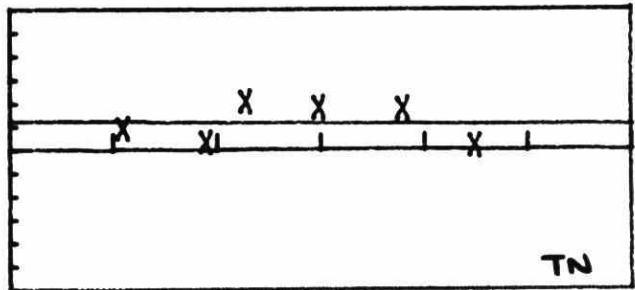
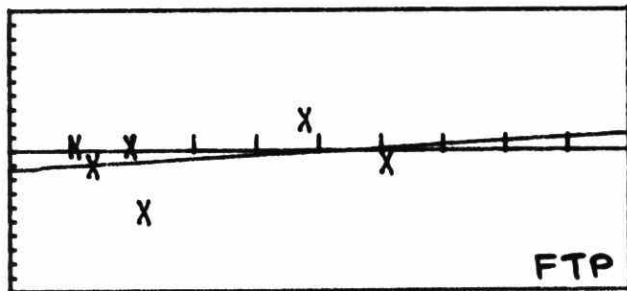
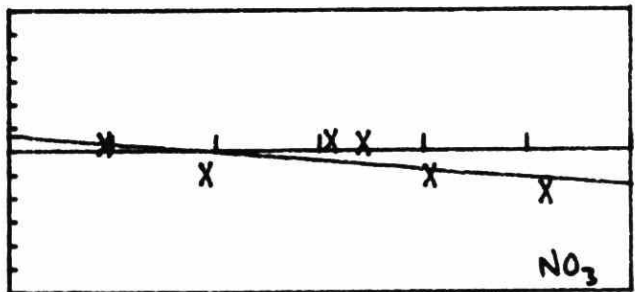
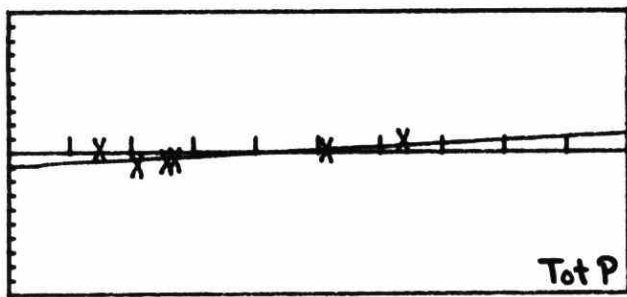


Nutrients LAB 3.



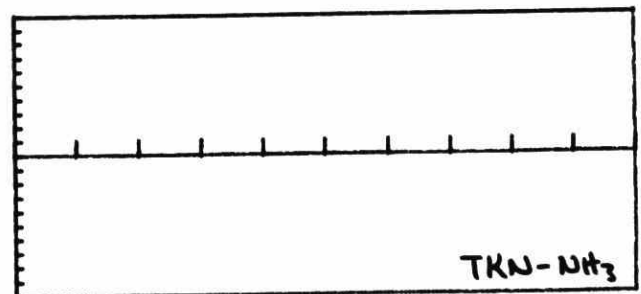
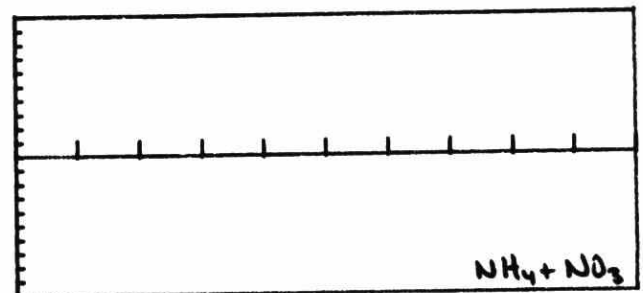
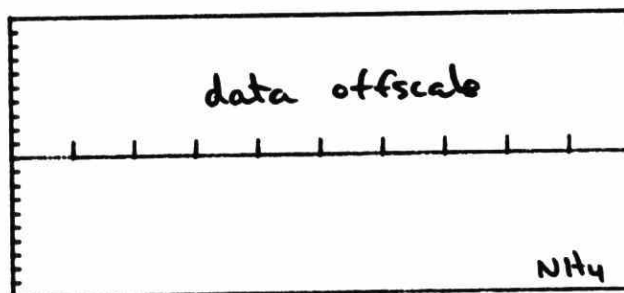
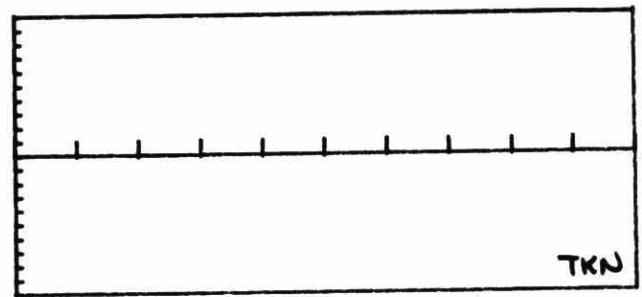
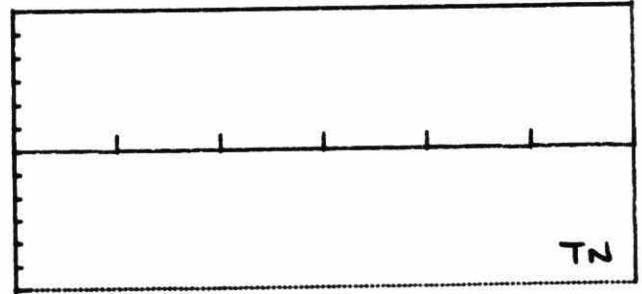
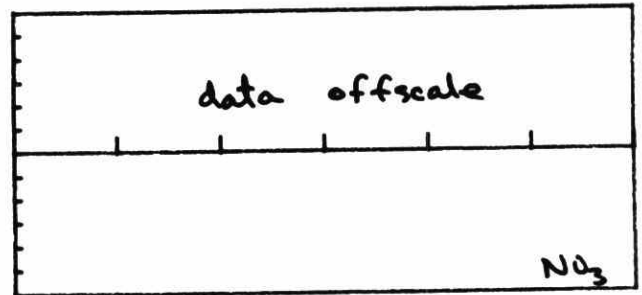
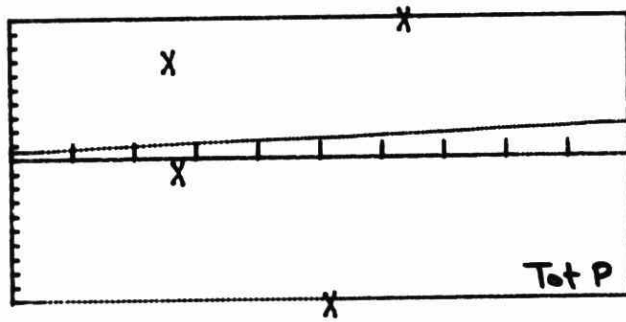
Nutrients III

LAB 4.



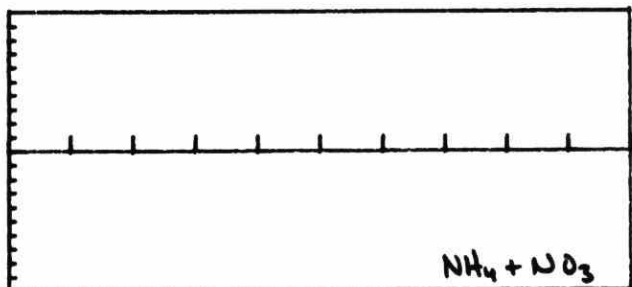
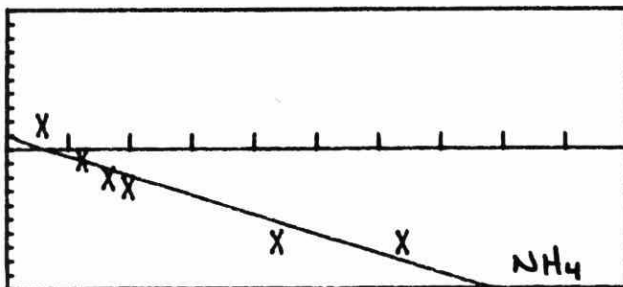
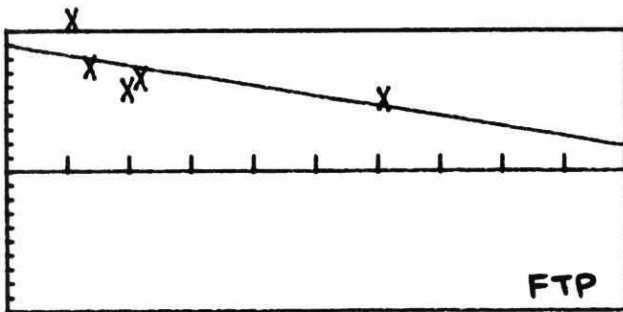
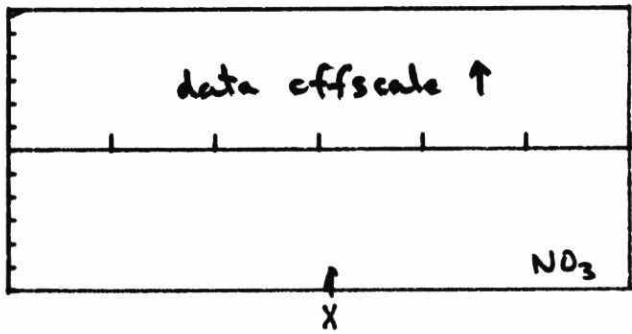
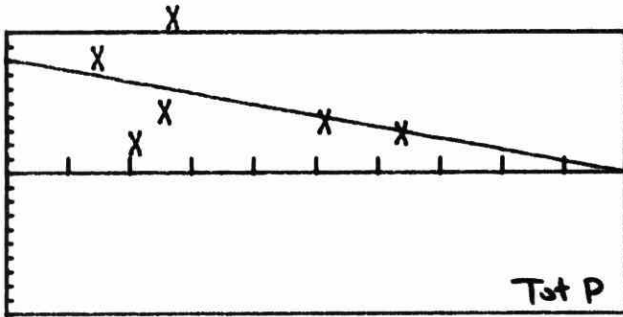
Nutrients III

LAB 5



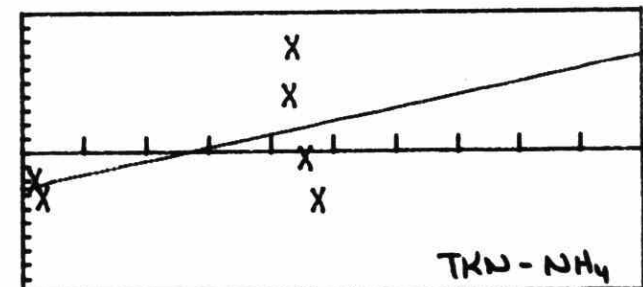
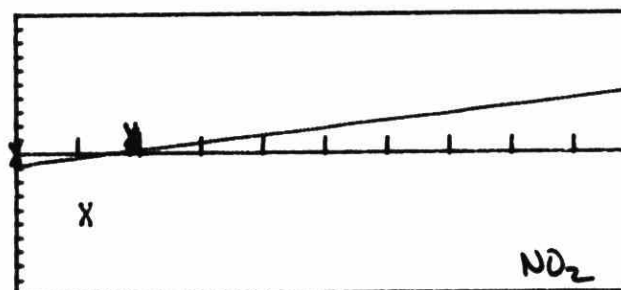
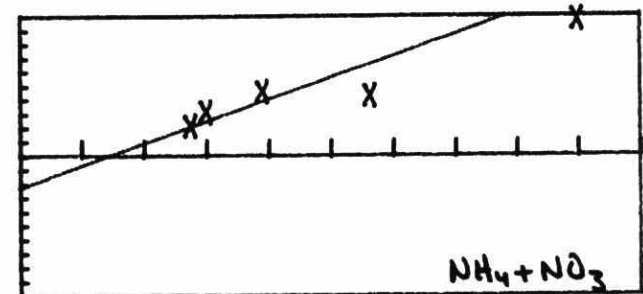
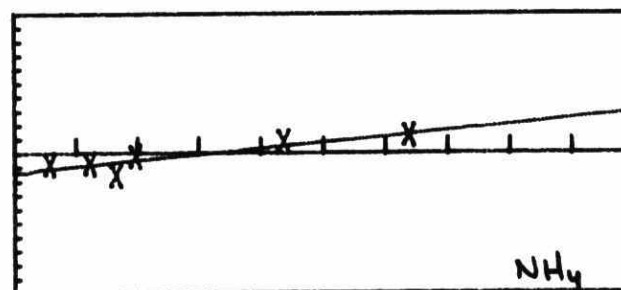
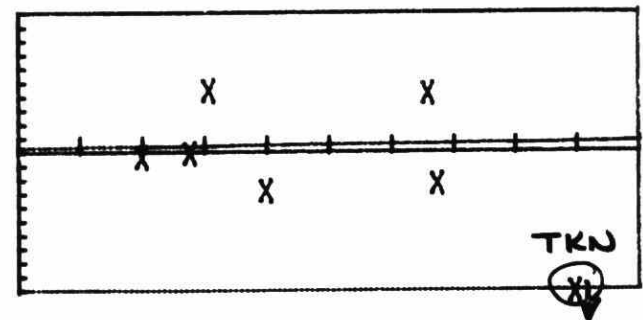
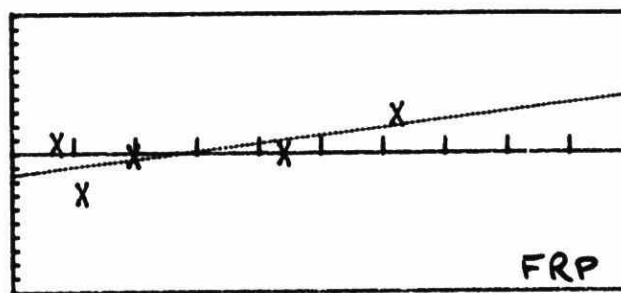
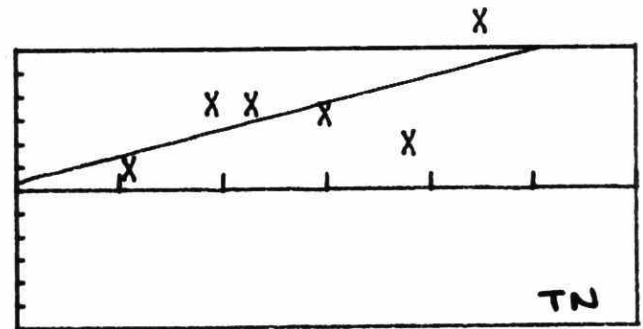
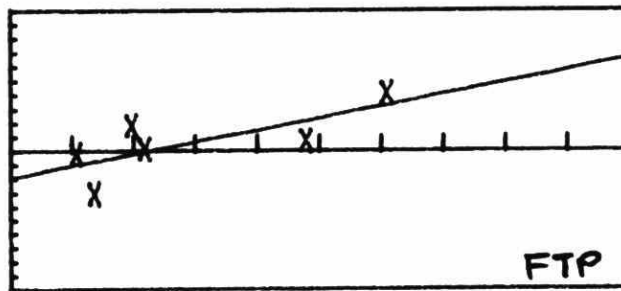
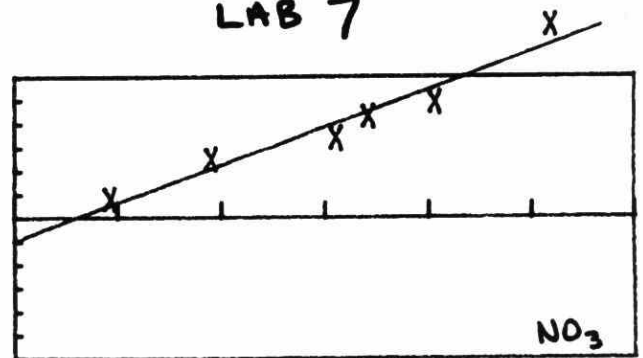
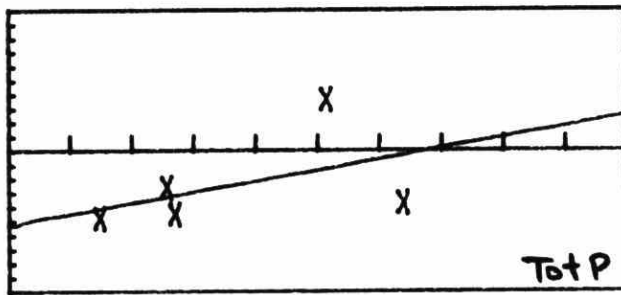
Nutrients III

LAB 6.



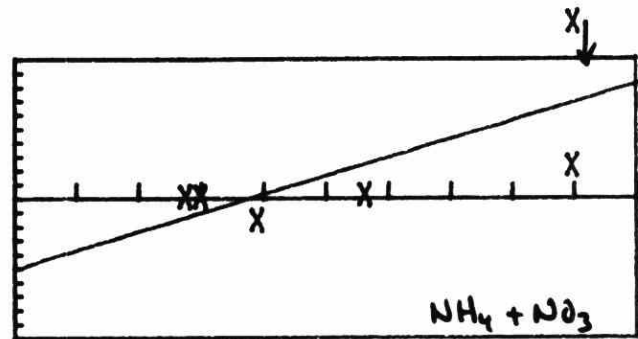
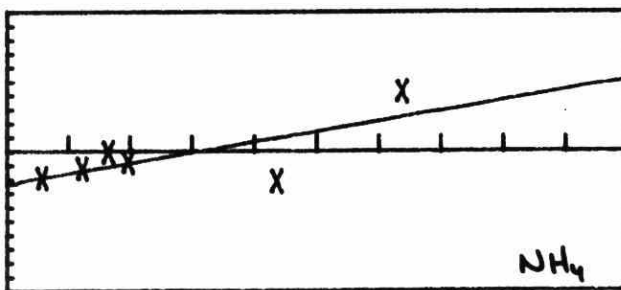
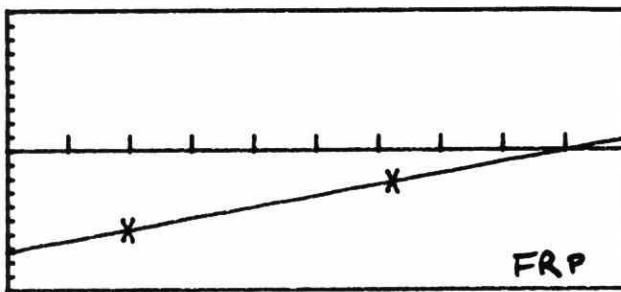
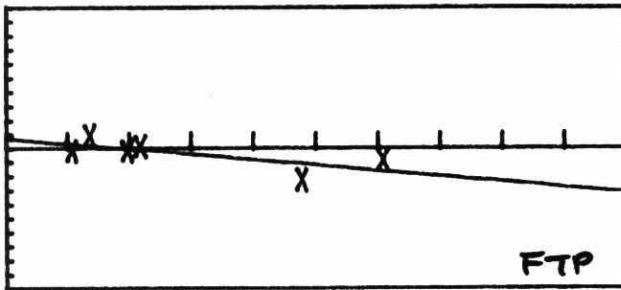
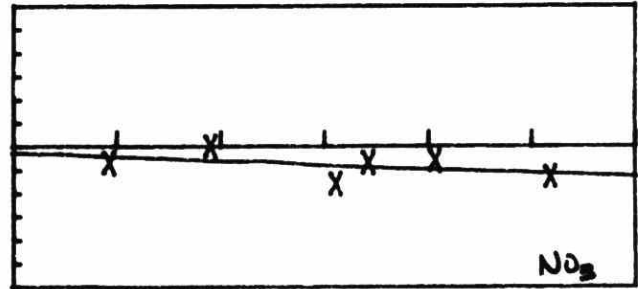
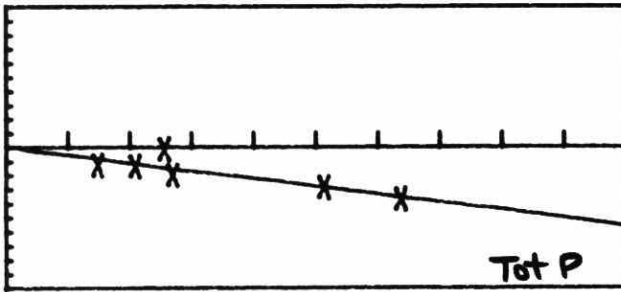
Nutrients III

LAB 7

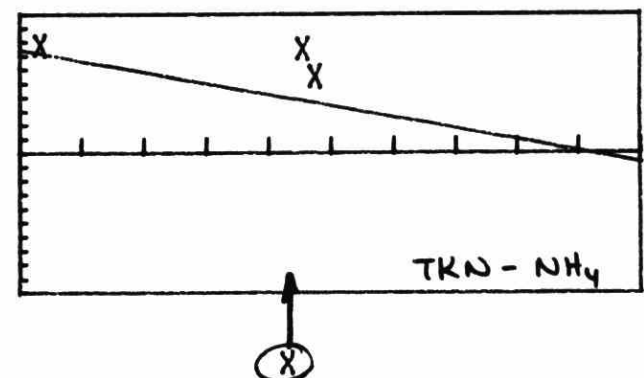
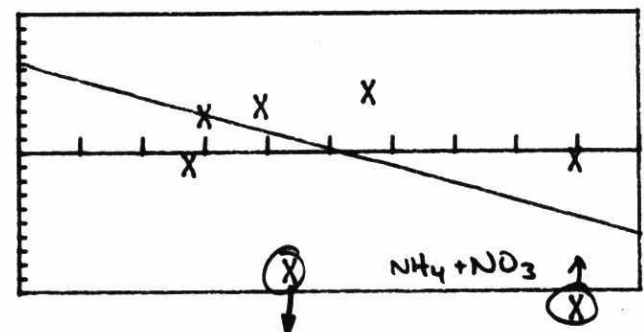
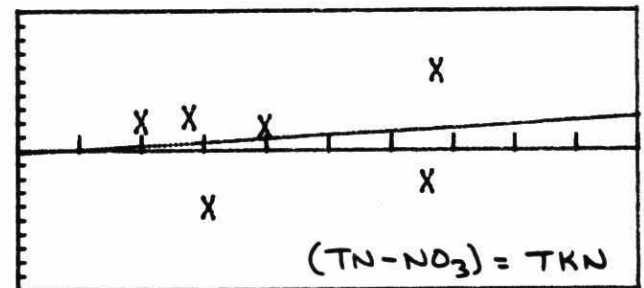
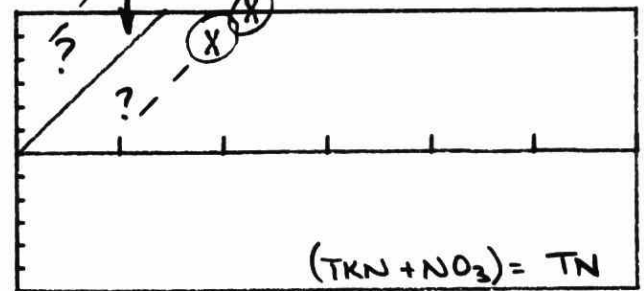
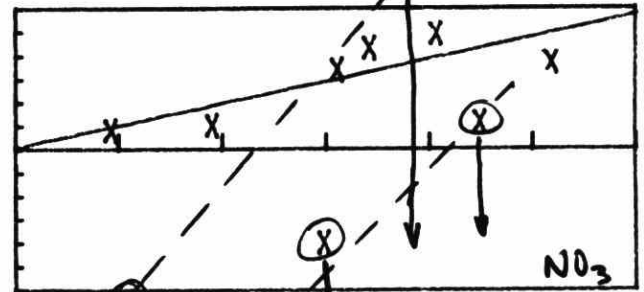
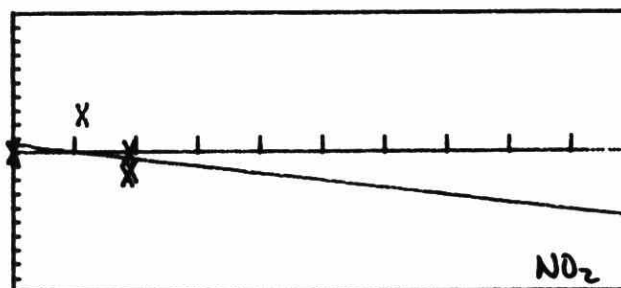
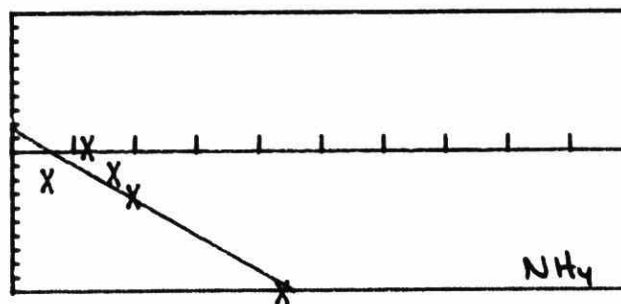
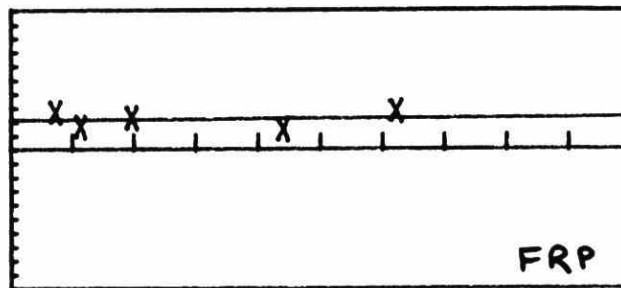
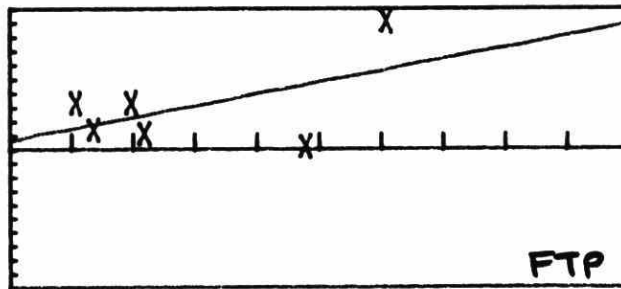
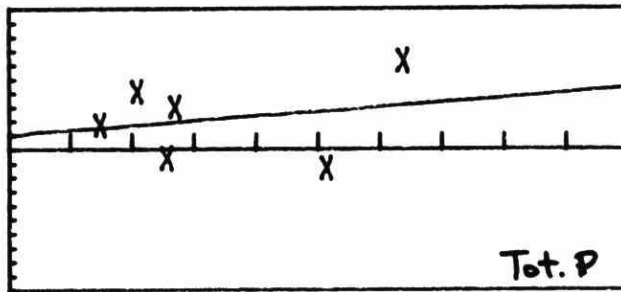


Nutrients III

LAB 8

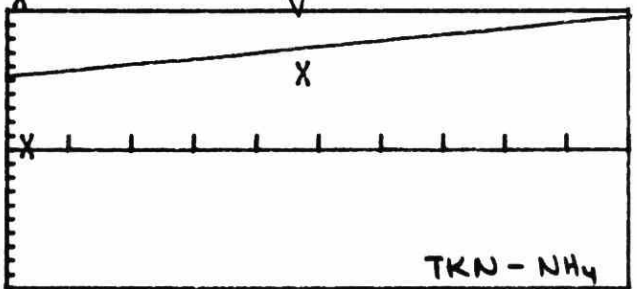
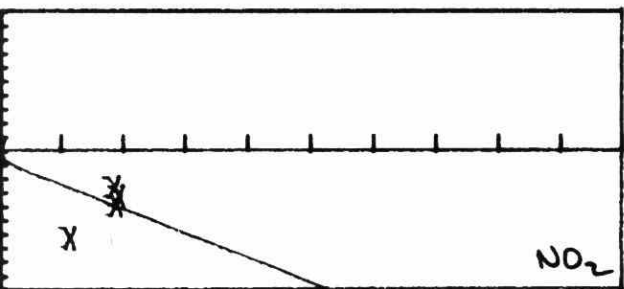
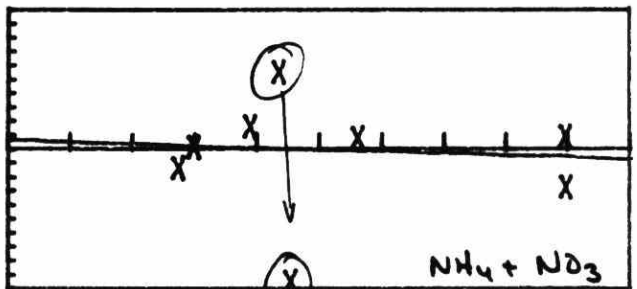
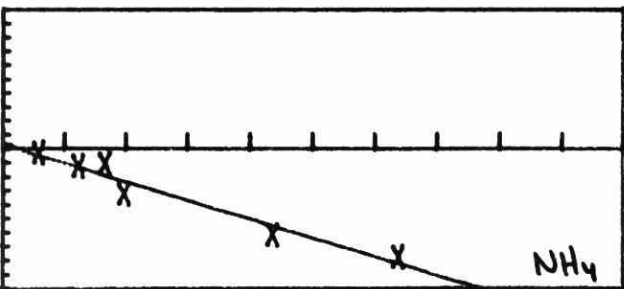
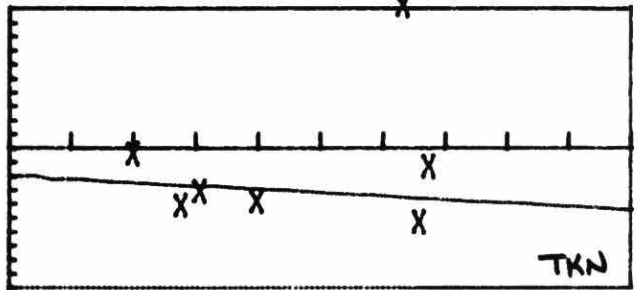
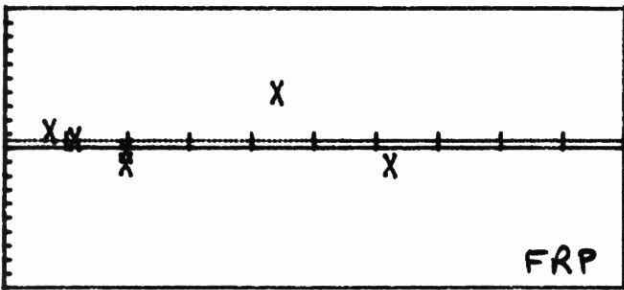
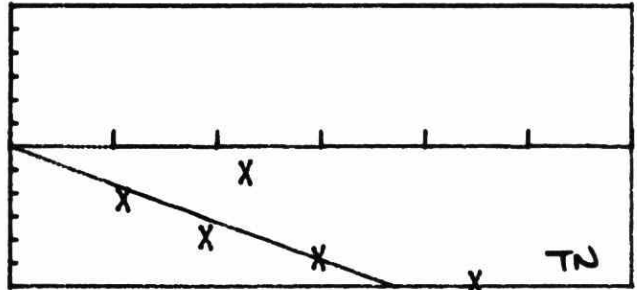
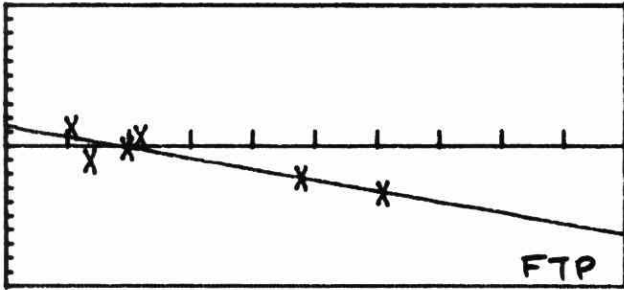
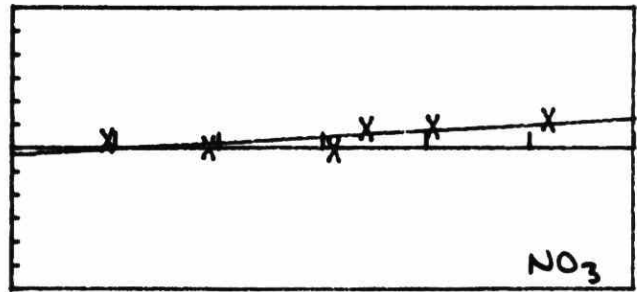
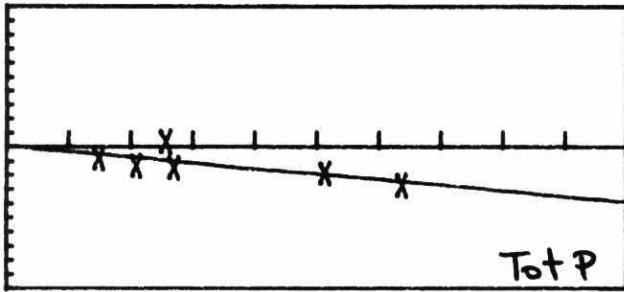


Nutrients III LAB 9



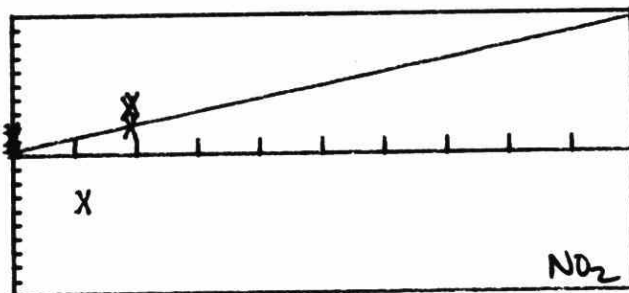
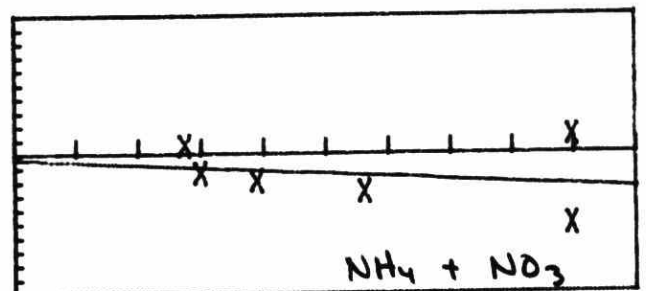
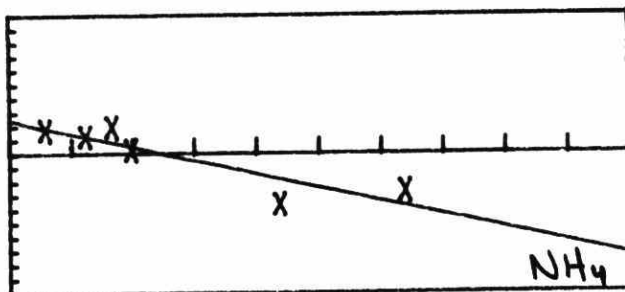
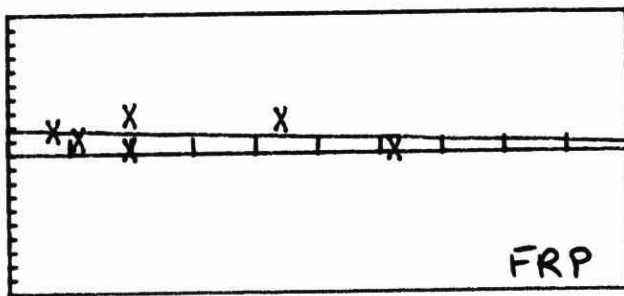
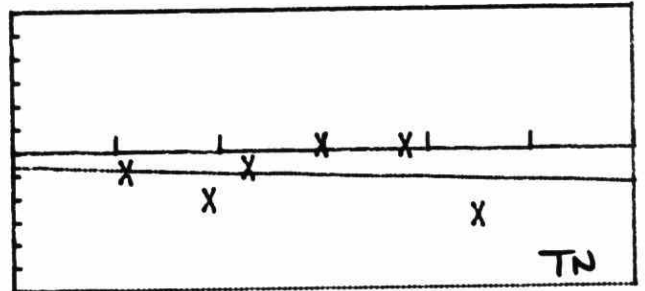
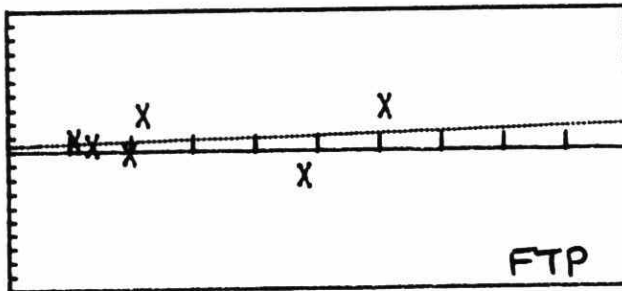
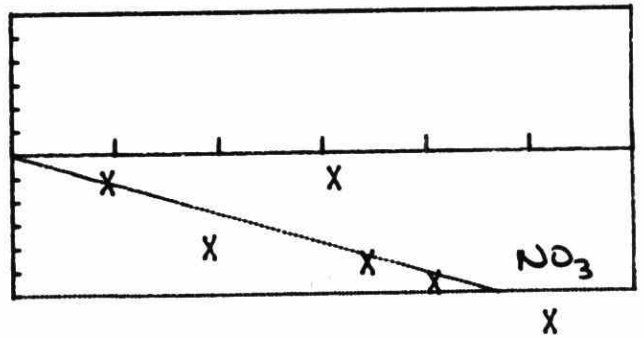
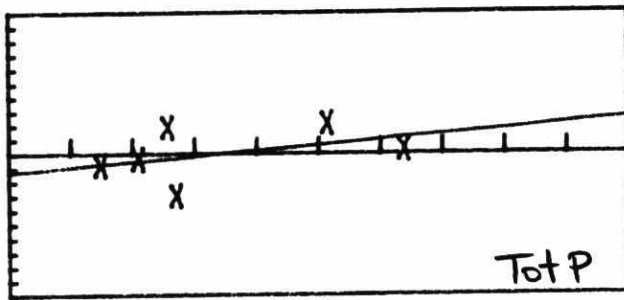
Nutrients II

LAB 10.



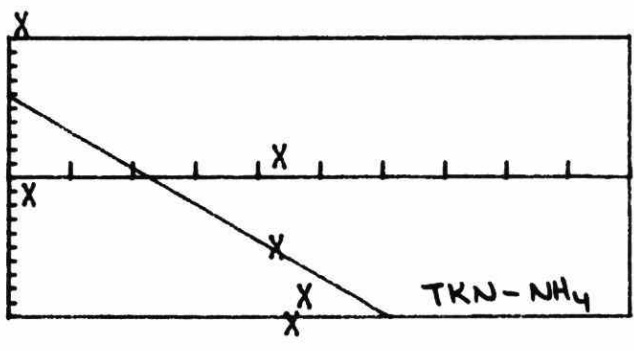
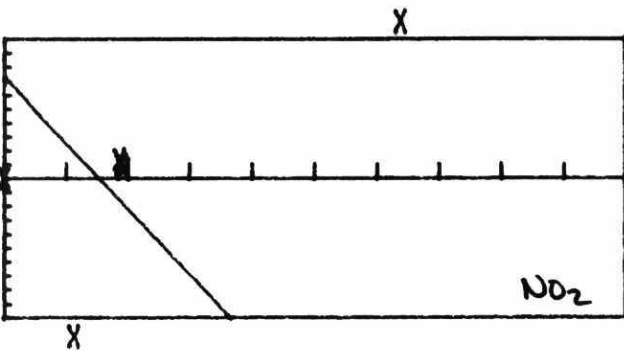
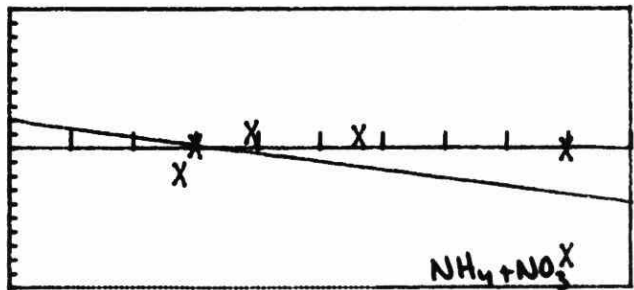
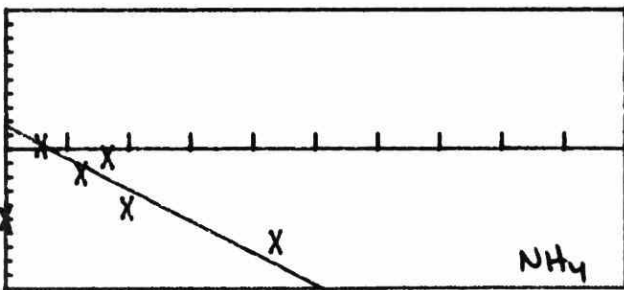
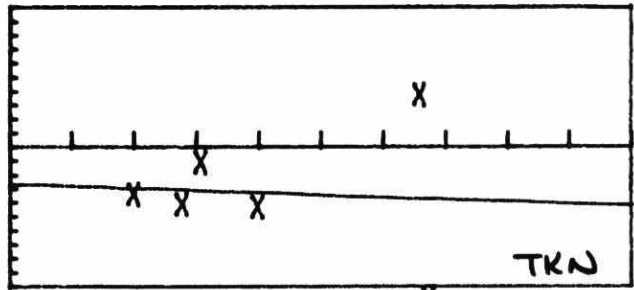
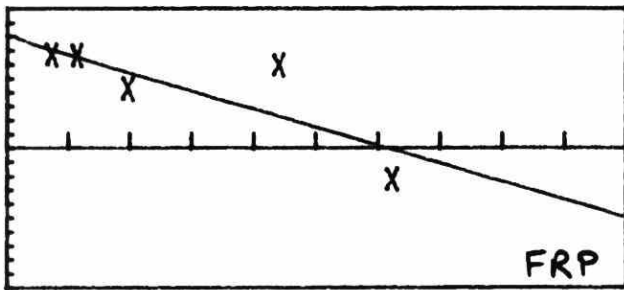
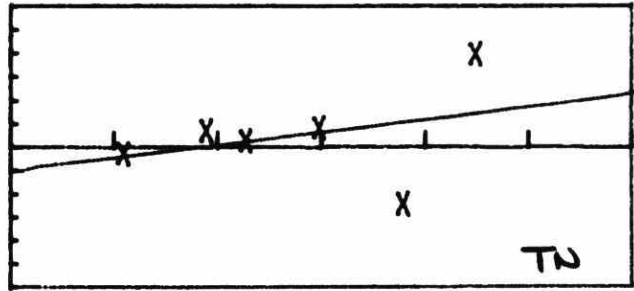
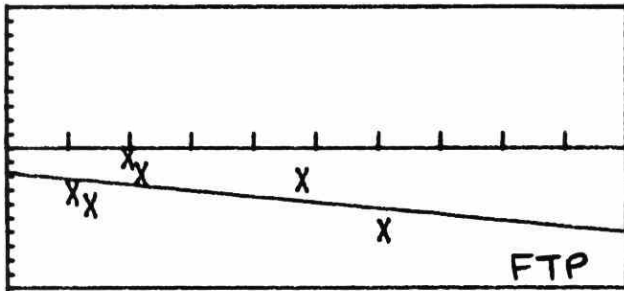
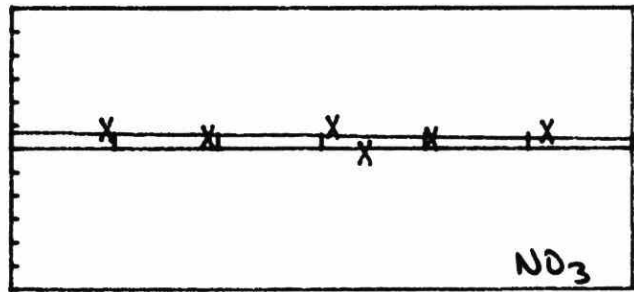
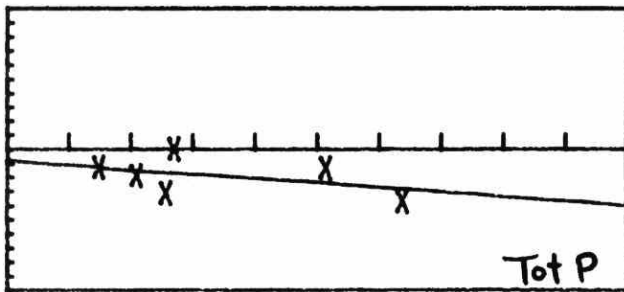
Nutrients III

LAB 11.



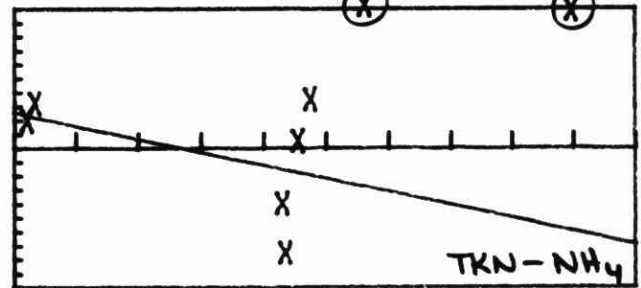
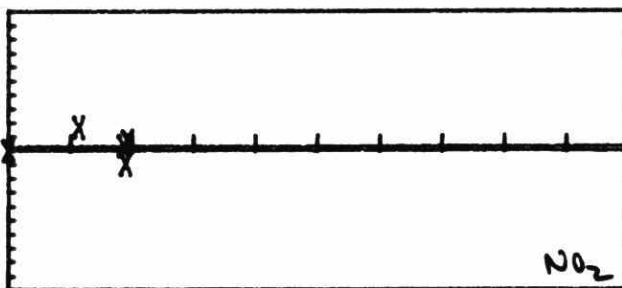
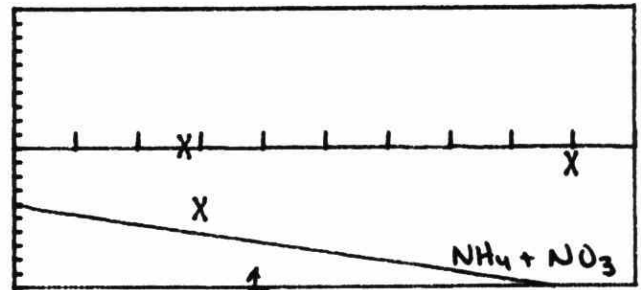
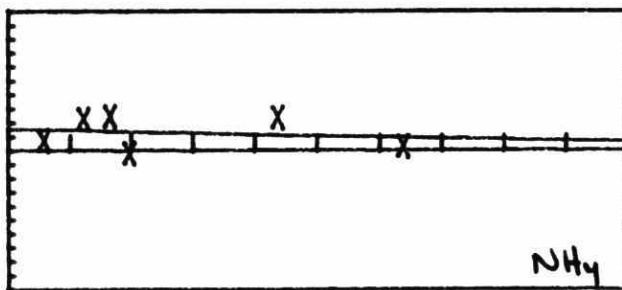
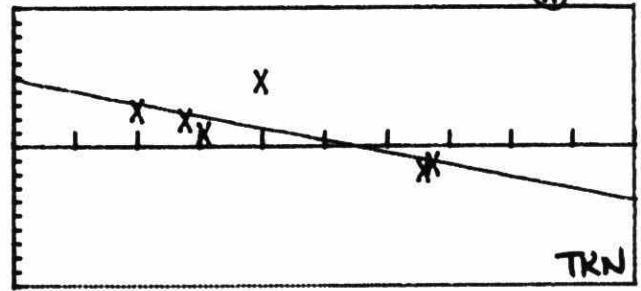
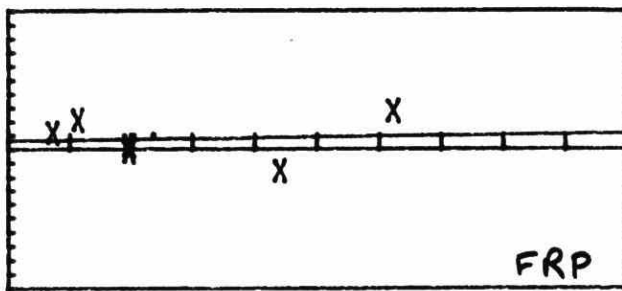
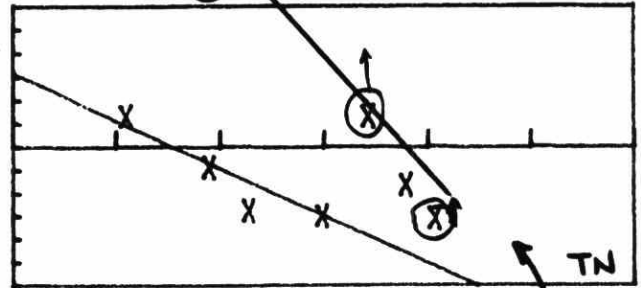
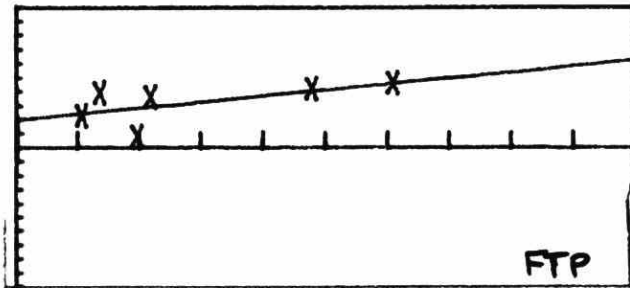
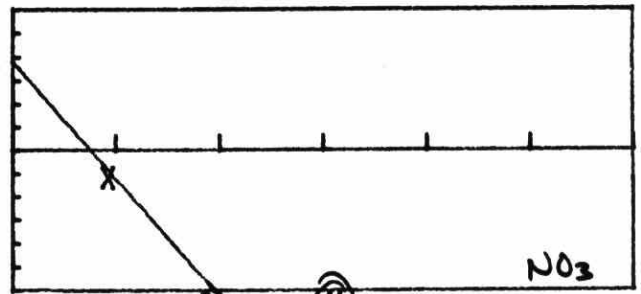
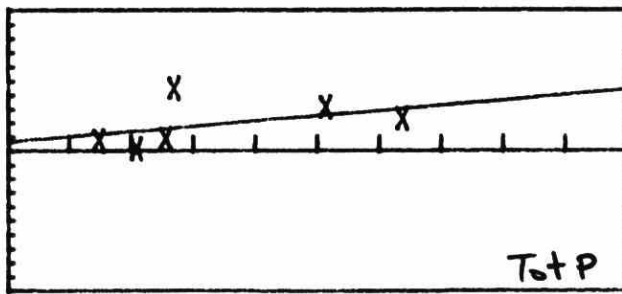
Nutrients III

LAB 12



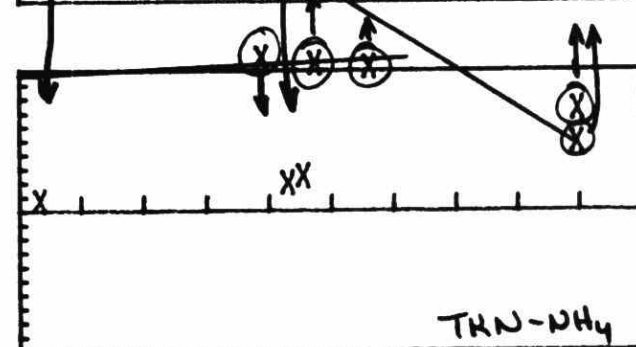
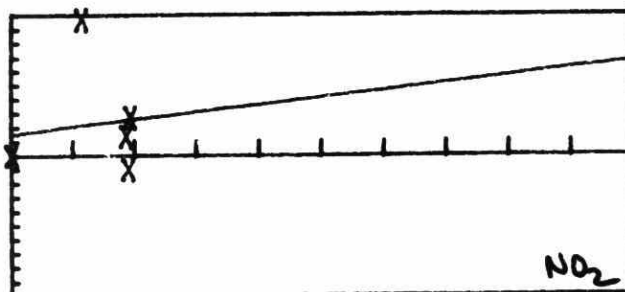
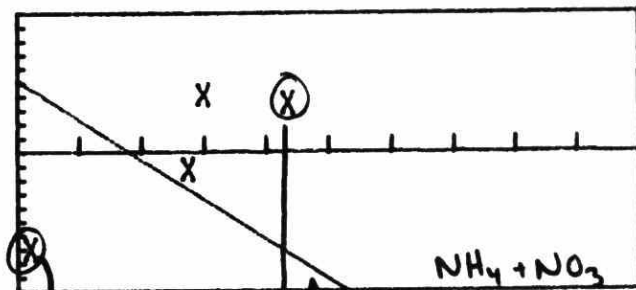
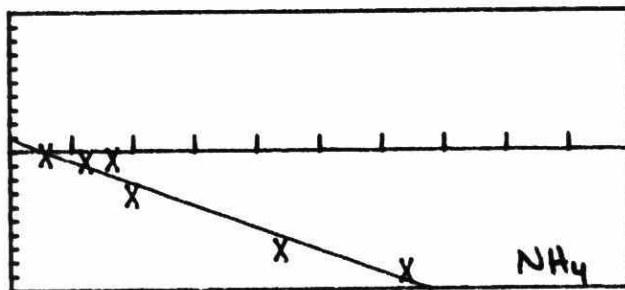
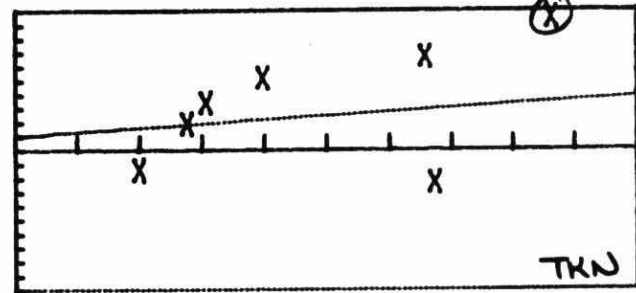
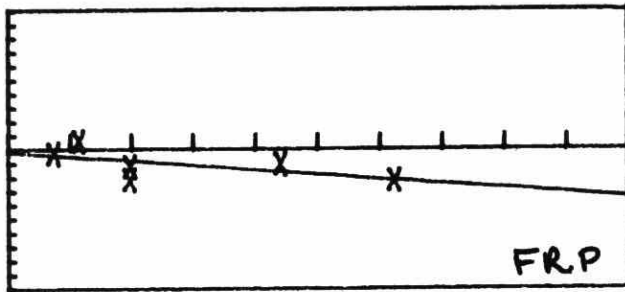
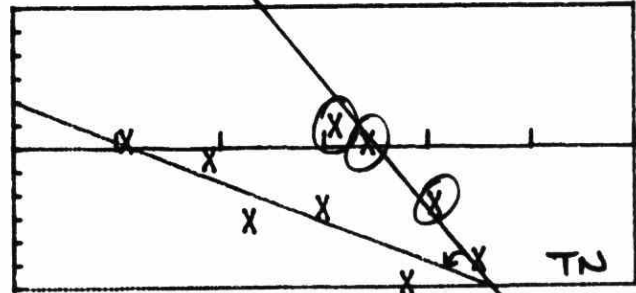
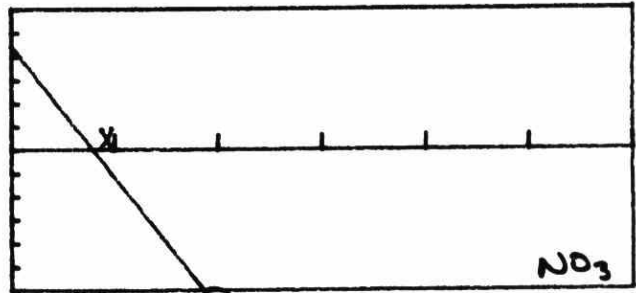
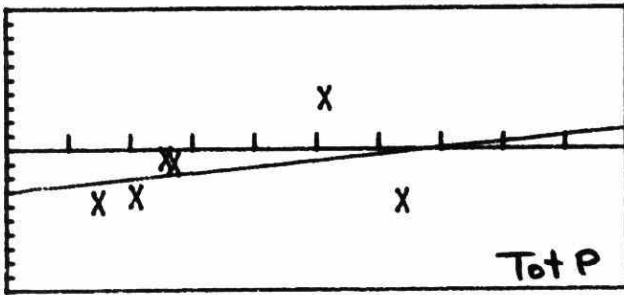
Nutrients III

Lab 13

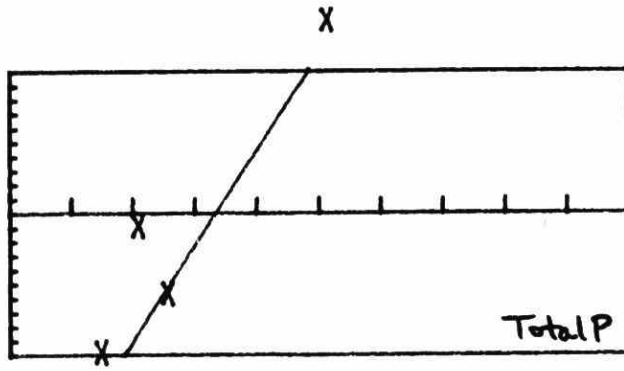


Nutrients III

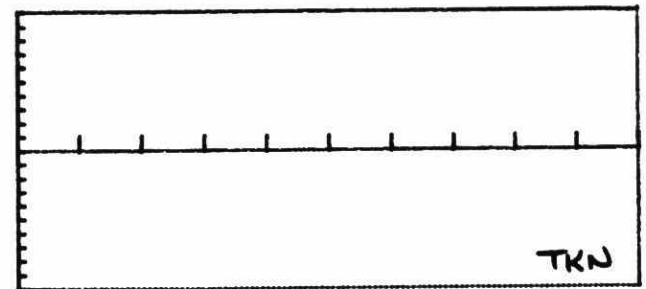
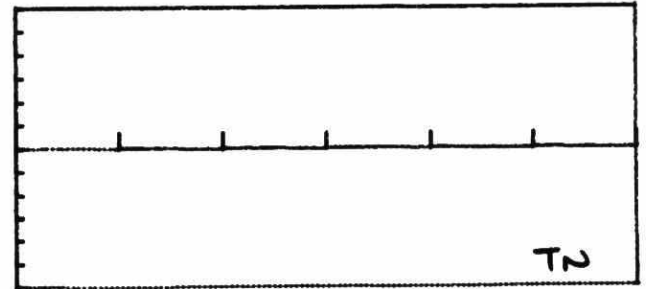
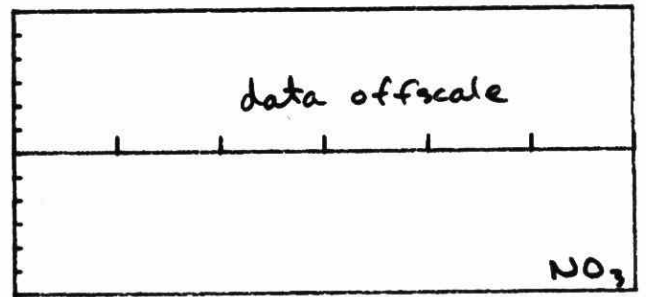
LAB 14.



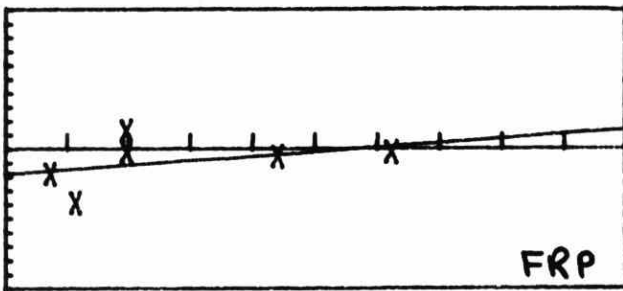
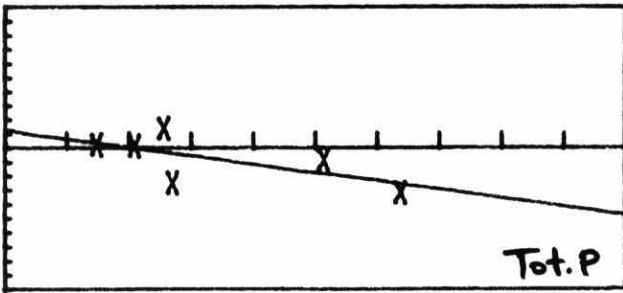
Nutrients III
LAB 15



X

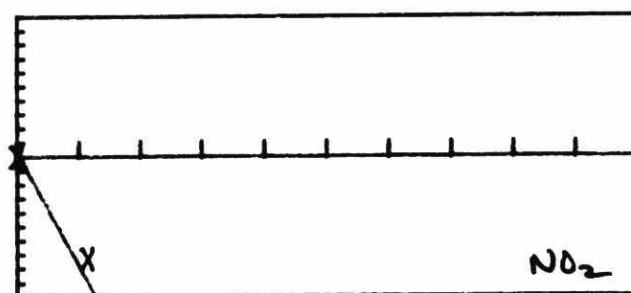
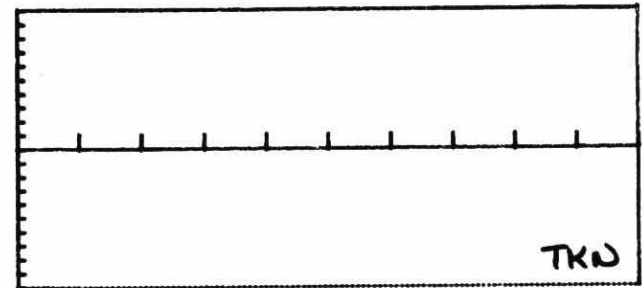
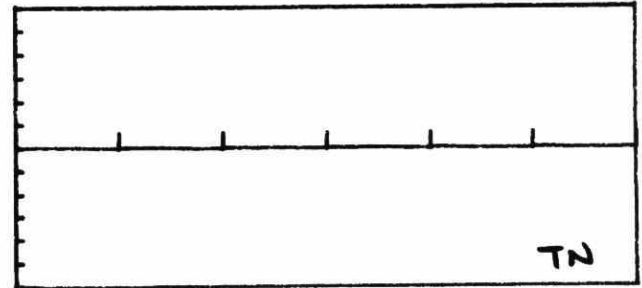
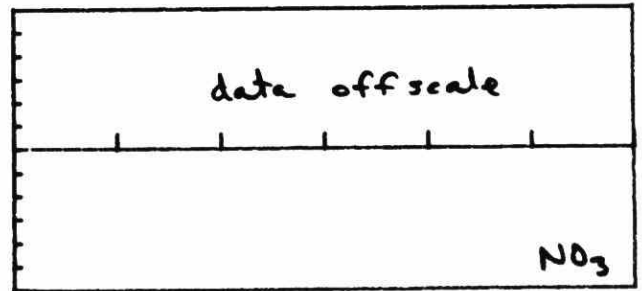
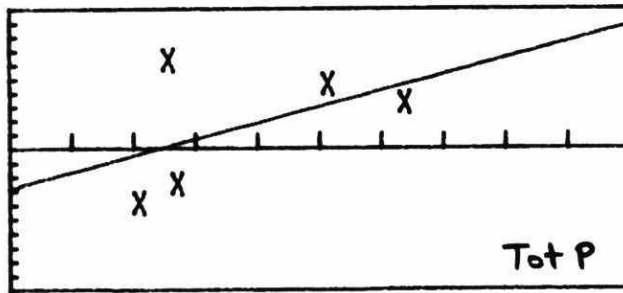


Nutrients III
LAB 16



Nutrients III

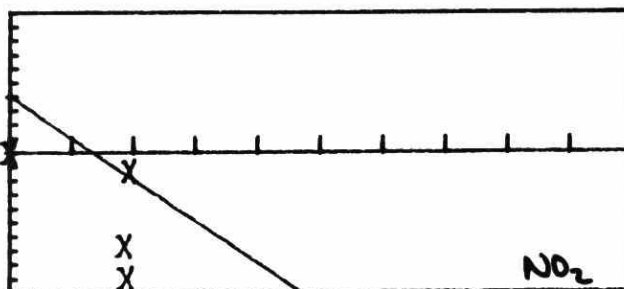
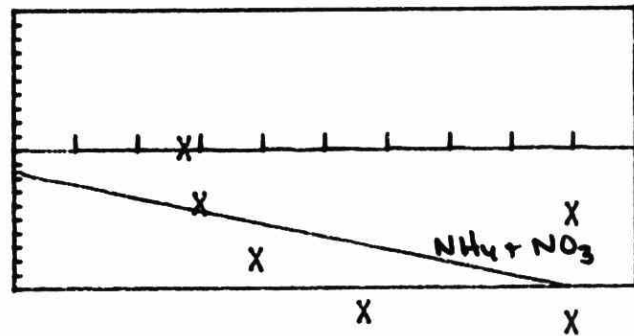
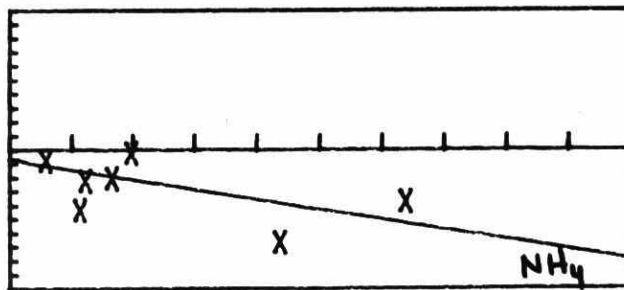
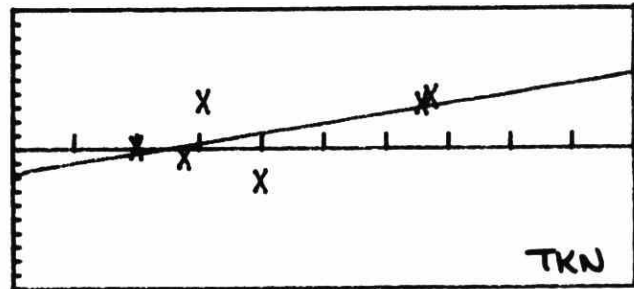
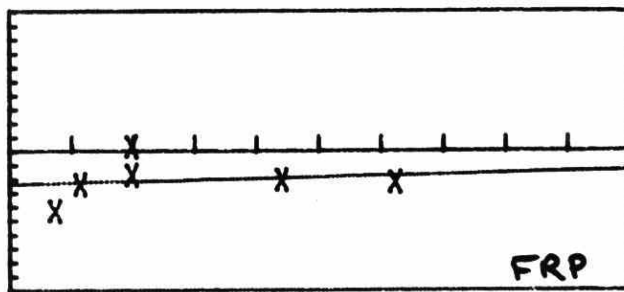
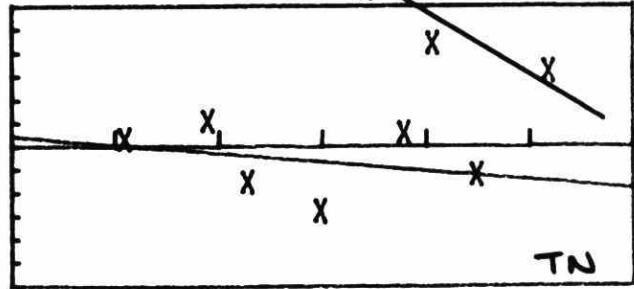
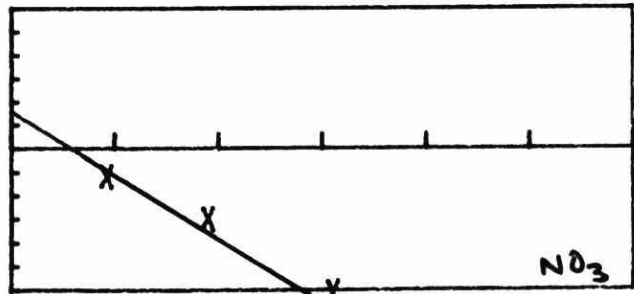
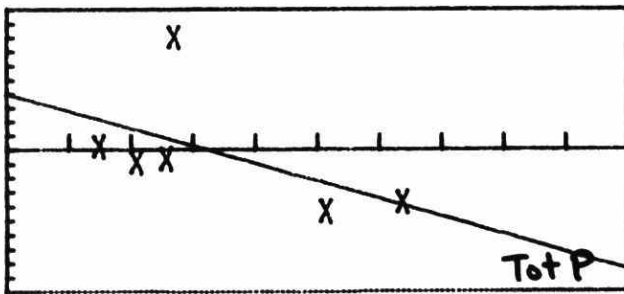
LAB 17



X

Nutrients III

LAB 18



Nutrients III

Lab # 1

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
NH3	0.029	0.046	0.042	0.008	3.91	0.42
TNO3	-0.068	0.087	0.081	-0.007	-9.83	-0.38
TIN	0.014	0.023	0.022	0.004	0.94	0.26

Lab # 2

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
NH3	0.152	0.058	0.052	0.179	-4.87	-0.42
TNO3	0.067	0.052	0.052	0.070	-0.46	-0.03
TN	0.461	0.109	0.108	0.485	-1.72	-0.11
TKN	0.313	0.068	0.062	0.364	-6.06	-0.40
TIN	0.272	0.070	0.069	0.292	-1.78	-0.16
OrgN	0.155	0.057	0.055	0.133	7.18	0.31

Lab # 3

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0047	0.0085	0.0065	-0.0038	12.52	0.64
FTP	0.0003	0.0150	0.0046	0.0156	-30.29	-0.95
FRP	0.0009	0.0038	0.0028	0.0039	-5.52	-0.69
NH3	0.026	0.039	0.028	-0.004	5.53	0.69
NO2	-0.0047	0.0053	0.0018	0.0007	-47.45	-0.94
TNO3	0.005	0.015	0.009	-0.015	3.25	0.76
TN	0.216	0.115	0.114	0.188	2.03	0.12
TKN	0.130	0.134	0.134	0.128	0.29	0.01
TIN	0.084	0.080	0.029	-0.045	11.64	0.93
OrgN	0.094	0.130	0.090	0.211	-38.07	-0.72

Lab # 4

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0003	0.0014	0.0010	-0.0018	2.26	0.69
FTP	-0.0012	0.0049	0.0048	-0.0027	2.54	0.24
FRP	-0.0016	0.0025	0.0025	-0.0014	-0.48	-0.09
NH3	-0.024	0.032	0.016	0.007	-5.62	-0.86
NO2	-0.0027	0.0035	0.0021	0.0003	-26.30	-0.79
TNO3	-0.010	0.021	0.017	0.013	-3.60	-0.58
TN	0.058	0.046	0.046	0.062	-0.31	-0.05
TKN	-0.013	0.030	0.025	0.014	-3.31	-0.51
TIN	0.020	0.021	0.013	-0.008	2.54	0.78
OrgN	-0.001	0.076	0.056	0.064	-21.15	-0.68

Lab # 5

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0026	0.0221	0.0221	0.0011	1.79	0.04
NH3	0.0000	0.000	0.000	0.000	0.000	0.000
TNO3	0.0000	0.000	0.000	0.000	0.000	0.000
TN	0.0000	0.000	0.000	0.000	0.000	0.000
TKN	0.0000	0.000	0.000	0.000	0.000	0.000
TIN	0.0000	0.000	0.000	0.000	0.000	0.000
OrgN	0.0000	0.000	0.000	0.000	0.000	0.000

Nutrients III

Lab # 6

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0107	0.0078	0.0070	0.0162	-8.13	-0.45
FTP	0.0143	0.0051	0.0038	0.0179	-7.21	-0.66
NH3	-0.058	0.075	0.028	0.018	-13.98	-0.93
TNO3	0.231	0.245	0.240	0.115	16.45	0.19
TIN	\$\$\$\$\$\$\$\$	0.000	0.000	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$

Lab # 7

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0048	0.0080	0.0072	-0.0105	7.82	0.46
FTP	0.0011	0.0053	0.0036	-0.0038	8.54	0.73
FRP	0.0000	0.0040	0.0030	-0.0031	5.74	0.68
NH3	-0.004	0.024	0.011	-0.027	4.30	0.89
NO2	-0.0002	0.0023	0.0023	-0.0008	5.27	0.24
TNO3	0.080	0.056	0.014	-0.019	16.00	0.97
TN	0.171	0.119	0.090	0.018	11.12	0.66
TKN	0.010	0.070	0.070	0.006	0.42	0.03
TIN	0.129	0.110	0.045	-0.044	15.68	0.91
OrgN	0.004	0.050	0.044	-0.025	9.42	0.46

Lab # 8

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0038	0.0028	0.0015	0.0000	-5.61	-0.85
FTP	-0.0009	0.0024	0.0017	0.0014	-3.88	-0.73
FRP	-0.0079	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$	-0.0146	8.08	1.00
NH3	-0.006	0.053	0.037	-0.047	7.52	0.71
TNO3	-0.016	0.013	0.011	-0.006	-1.73	-0.47
TIN	0.047	0.117	0.081	-0.100	13.28	0.72

Lab # 9

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0044	0.0065	0.0063	0.0021	3.34	0.22
FTP	0.0061	0.0072	0.0061	0.0013	8.26	0.53
FRP	0.0044	0.0012	0.0012	0.0042	0.20	0.08
NH3	-0.067	0.092	0.036	0.033	-25.60	-0.92
NO2	-0.0001	0.0017	0.0016	0.0005	-5.28	-0.32
TNO3	0.060	0.038	0.021	0.002	9.44	0.83
TN	0.576	0.382	0.243	-0.002	42.03	0.77
TKN	0.018	0.079	0.078	-0.003	2.57	0.15
TIN	-0.009	0.127	0.100	0.128	-12.34	-0.62
OrgN	0.045	0.135	0.134	0.074	-8.06	-0.13

Lab # 10

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0026	0.0023	0.0016	0.0001	-3.97	-0.74
FTP	-0.0017	0.0040	0.0019	0.0028	-7.71	-0.88
FRP	0.0010	0.0043	0.0043	0.0010	-0.03	-0.00
NH3	-0.066	0.068	0.015	0.006	-13.39	-0.98
NO2	-0.0027	0.0027	0.0020	-0.0007	-17.53	-0.67
TNO3	0.010	0.012	0.008	-0.006	2.57	0.74
TN	-0.224	0.153	0.102	-0.002	-16.13	-0.74
TKN	-0.060	0.041	0.039	-0.039	-2.48	-0.27
TIN	-0.003	0.036	0.035	0.012	-1.34	-0.24
OrgN	0.066	0.199	0.199	0.053	4.31	0.05

Nutrients III

Lab # 11

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0000	0.0042	0.0039	-0.0026	3.85	0.39
FTP	0.0016	0.0041	0.0040	0.0009	1.31	0.15
FRP	0.0029	0.0024	0.0023	0.0035	-1.15	-0.23
NH3	-0.004	0.054	0.024	0.048	-9.72	-0.90
NO2	0.0014	0.0028	0.0026	0.0003	9.30	0.34
TNO3	-0.080	0.055	0.034	-0.001	-12.73	-0.79
TN	-0.052	0.068	0.068	-0.033	-1.38	-0.14
TIN	-0.031	0.052	0.050	-0.007	-2.13	-0.26

Lab # 12

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0038	0.0030	0.0027	-0.0016	-3.24	-0.46
FTP	-0.0060	0.0041	0.0036	-0.0036	-4.23	-0.47
FRP	0.0085	0.0087	0.0051	0.0160	-12.98	-0.81
NH3	-0.089	0.116	0.029	0.033	-22.76	-0.97
NO2	0.0019	0.0113	0.0102	0.0073	-47.19	-0.44
TNO3	0.010	0.009	0.009	0.013	-0.48	-0.13
TN	0.025	0.116	0.109	-0.050	5.44	0.33
TKN	-0.067	0.106	0.105	-0.053	-1.59	-0.07
TIN	-0.026	0.074	0.064	0.039	-5.89	-0.50
OrgN	-0.021	0.087	0.060	0.059	-25.93	-0.73

Lab # 13

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0039	0.0037	0.0034	0.0013	3.76	0.43
FTP	0.0065	0.0032	0.0025	0.0040	4.26	0.61
FRP	0.0015	0.0035	0.0035	0.0012	0.50	0.07
NH3	0.026	0.027	0.026	0.031	-0.95	-0.18
NO2	0.0003	0.0010	0.0010	0.0003	0.00	0.00
TNO3	-0.236	0.131	0.060	0.076	-50.41	-0.94
TN	-0.124	0.171	0.093	0.158	-20.47	-0.84
TKN	0.023	0.055	0.038	0.097	-8.84	-0.73
TIN	-0.158	0.154	0.148	-0.083	-6.73	-0.28
OrgN	-0.004	0.050	0.044	0.025	-9.42	-0.46

Lab # 14

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0030	0.0064	0.0061	-0.0059	4.40	0.30
FRP	-0.0021	0.0025	0.0019	-0.0004	-3.23	-0.62
NH3	-0.069	0.082	0.020	0.017	-16.08	-0.97
NO2	0.0021	0.0044	0.0043	0.0015	5.25	0.12
TNO3	-0.258	0.191	0.021	0.088	-55.96	-0.99
TN	-0.139	0.134	0.056	0.100	-17.35	-0.91
TKN	0.045	0.080	0.079	0.022	2.79	0.16
TIN	-0.213	0.218	0.121	0.102	-28.48	-0.83
OrgN	0.104	0.124	0.123	0.096	2.50	0.05

Lab # 15

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0005	0.0325	0.0151	-0.0448	66.94	0.88
TNO3	0.0000	0.000	0.000	0.000	0.000	0.000
TN	0.000	0.000	0.000	0.000	0.000	0.000
TKN	0.000	0.000	0.000	0.000	0.000	0.000

Nutrients III

Lab # 16

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0016	0.0039	0.0029	0.0024	-6.00	-0.66
FRP	-0.0018	0.0039	0.0036	-0.0036	3.18	0.38

Lab # 17

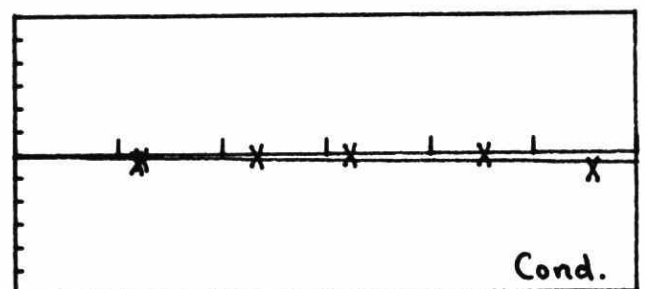
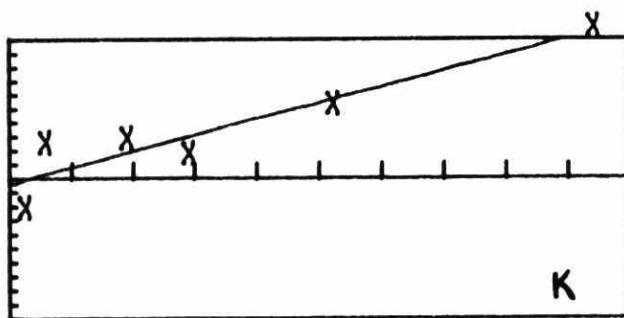
Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	0.0032	0.0104	0.0091	-0.0056	11.65	0.43
NO2	-0.0089	0.0085	0.0011	0.0003	-80.58	-0.99
TNO3	\$\$\$\$\$\$\$\$	0.000	0.000	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$
TN	\$\$\$\$\$\$\$\$	0.000	0.000	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$
TKN	\$\$\$\$\$\$\$\$	0.000	0.000	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$	\$\$\$\$\$\$\$\$

Lab # 18

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
TotP	-0.0005	0.0099	0.0083	0.0080	-12.45	-0.54
FRP	-0.0041	0.0033	0.0033	-0.0047	1.01	0.15
NH3	-0.053	0.052	0.038	-0.014	-7.17	-0.68
NO2	0.0006	0.0117	0.0113	0.0040	-29.71	-0.26
TNO3	-0.136	0.094	0.017	0.031	-27.08	-0.98
TN	-0.030	0.084	0.079	0.021	-3.75	-0.31
TKN	0.025	0.056	0.047	-0.034	7.06	0.57
TIN	-0.136	0.110	0.092	-0.032	-9.44	-0.55

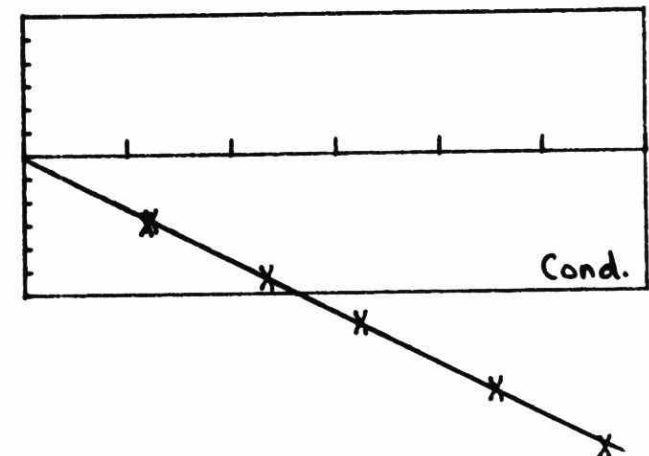
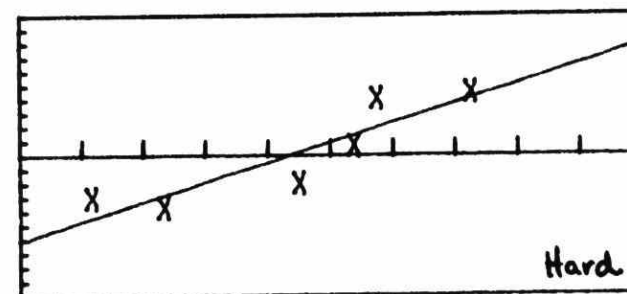
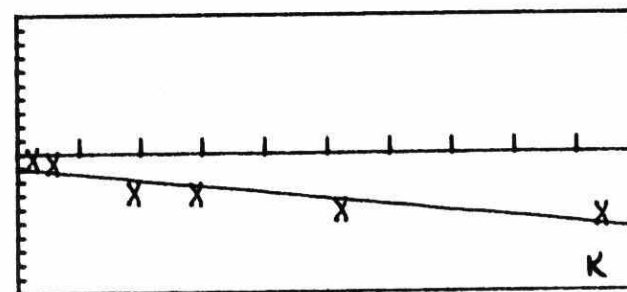
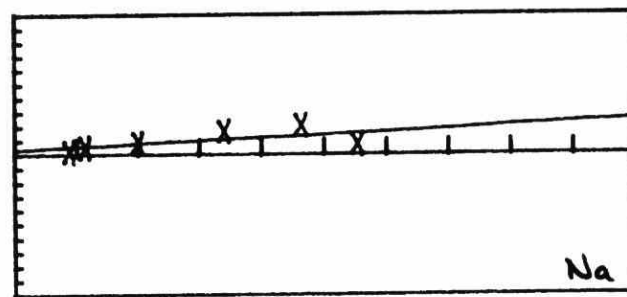
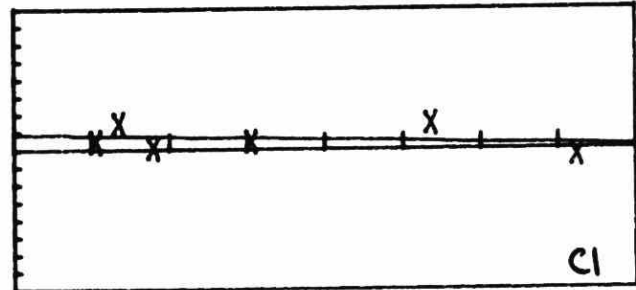
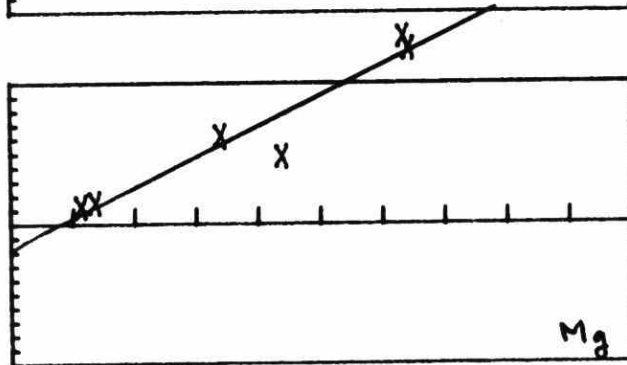
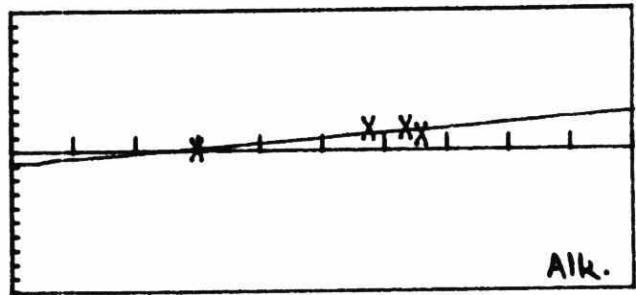
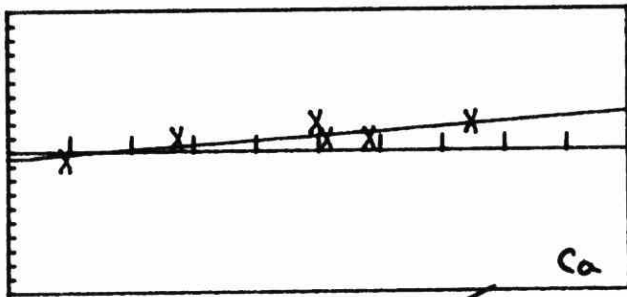
Minerals III

LAB I.



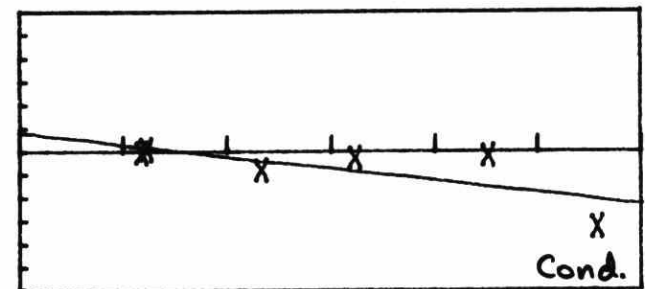
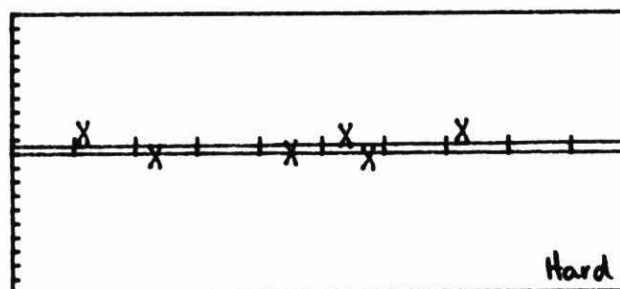
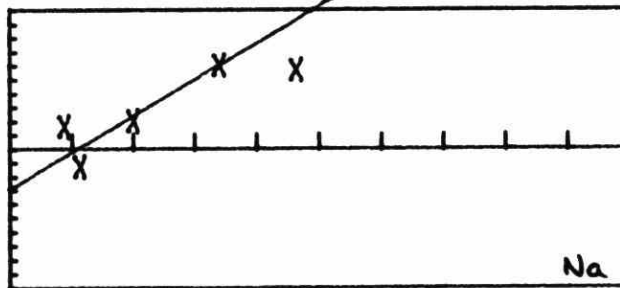
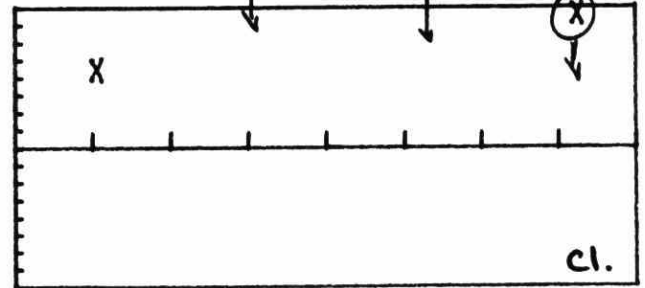
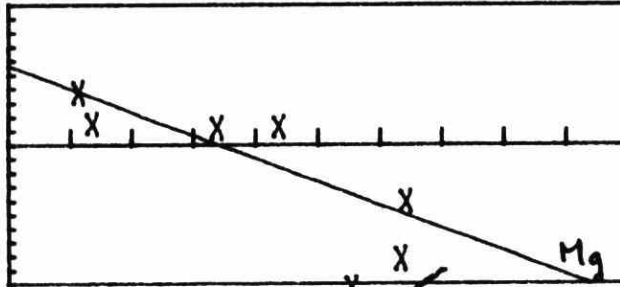
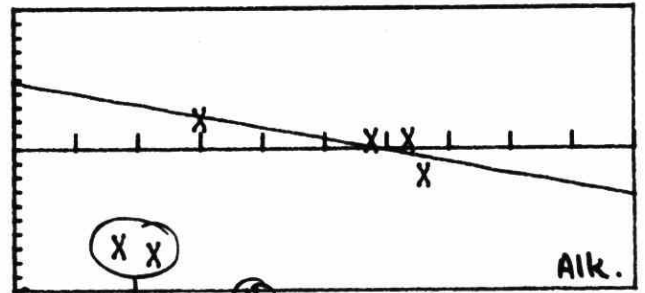
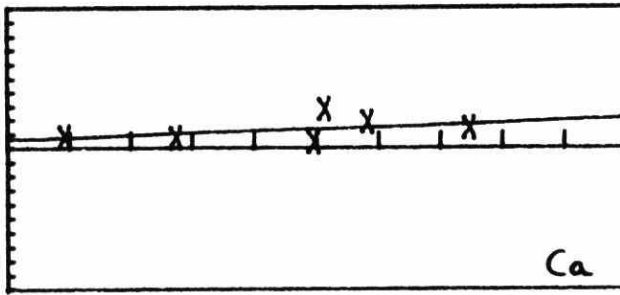
Minerals III

LAB 2



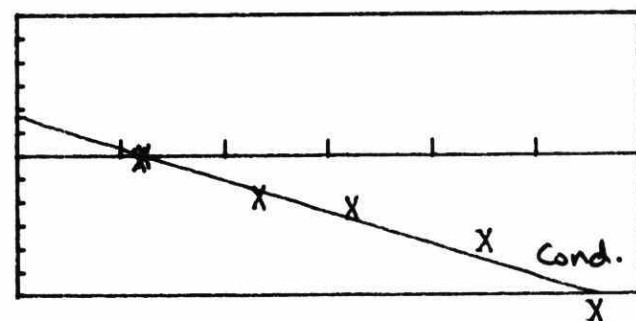
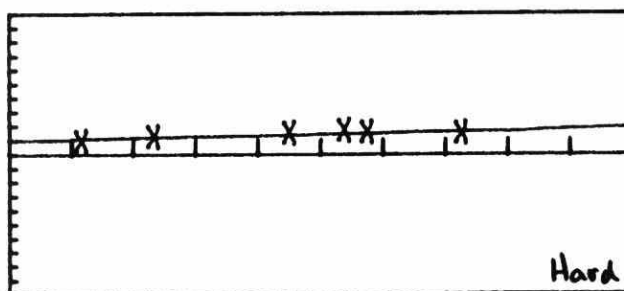
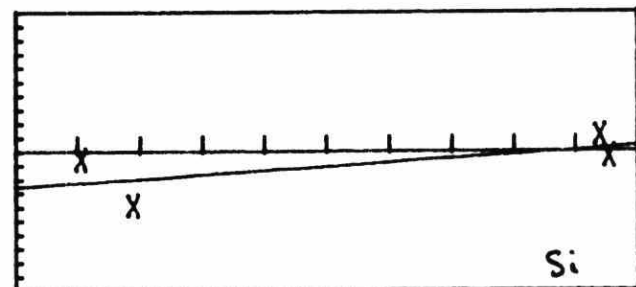
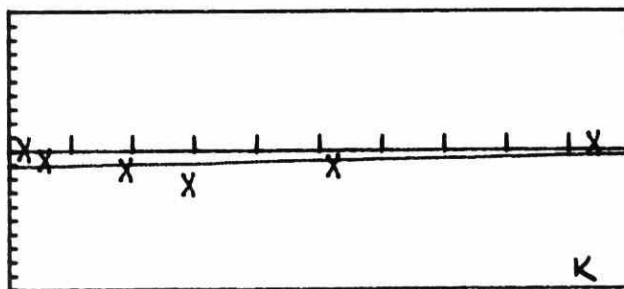
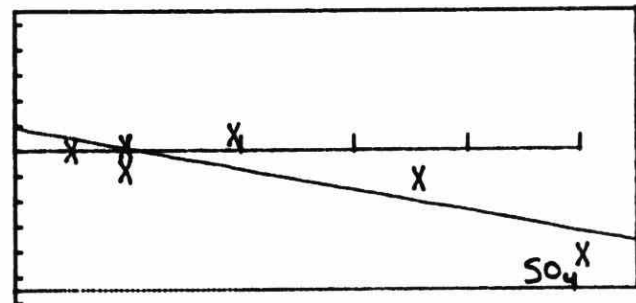
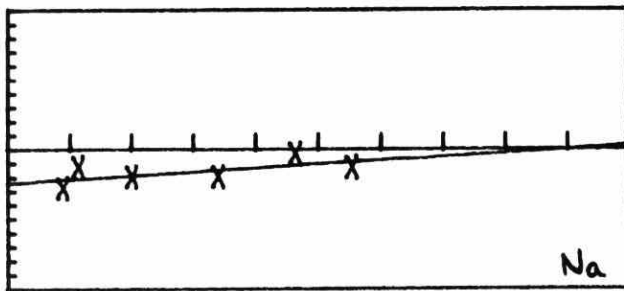
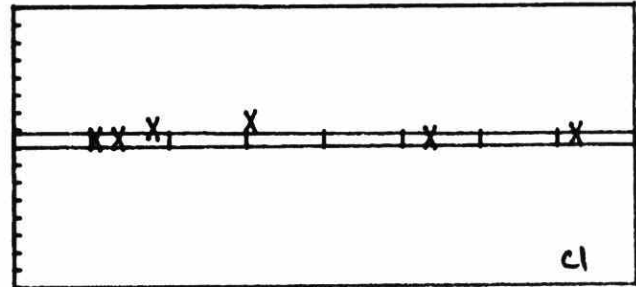
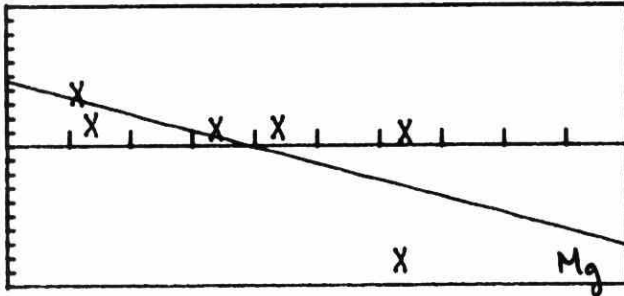
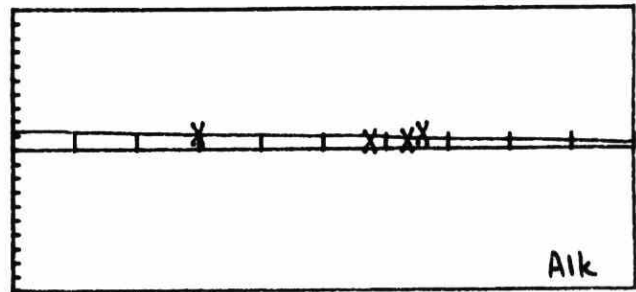
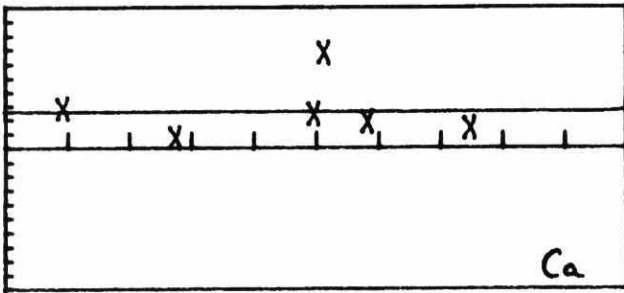
Minerals III

LAB 3.



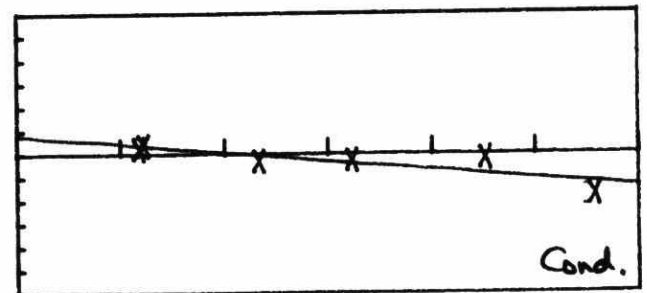
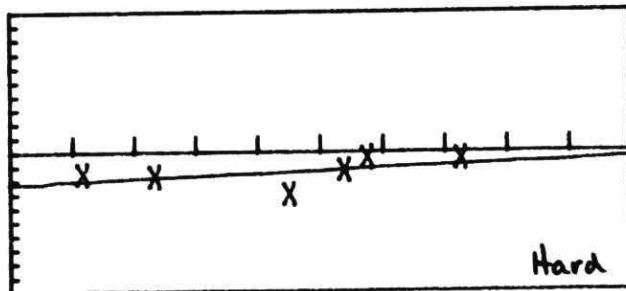
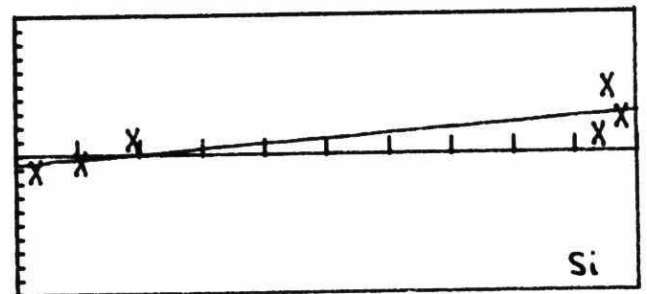
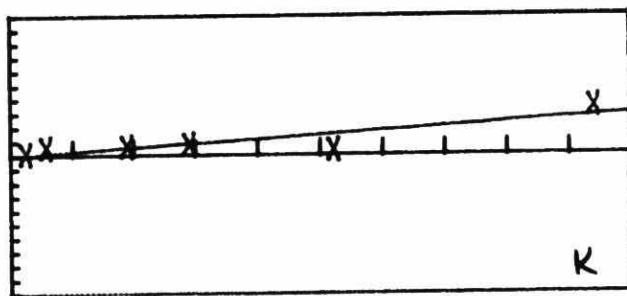
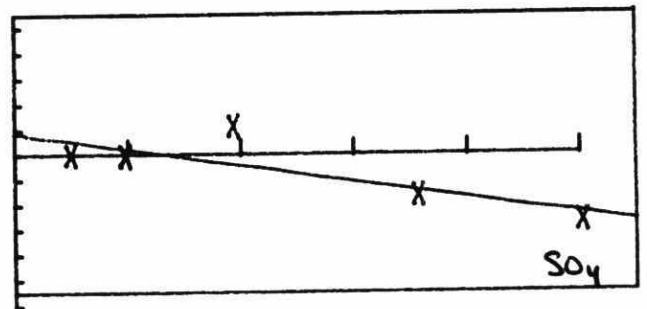
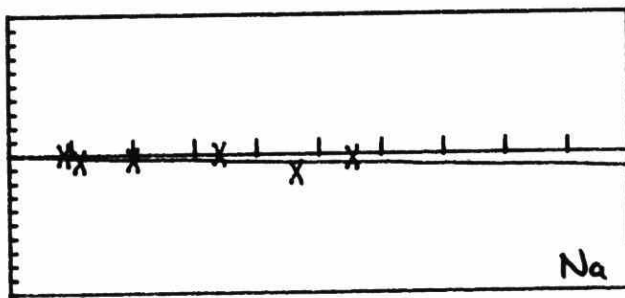
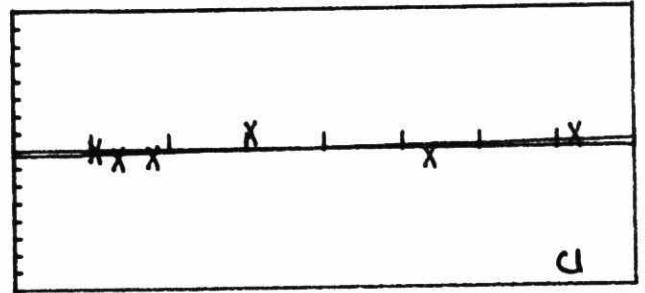
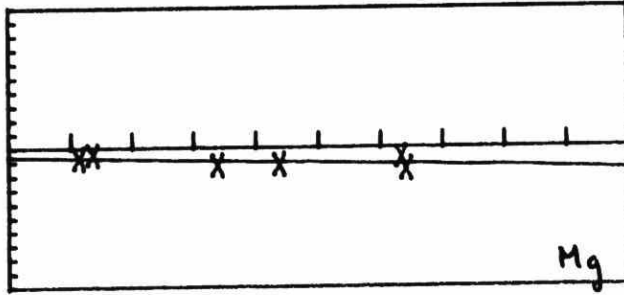
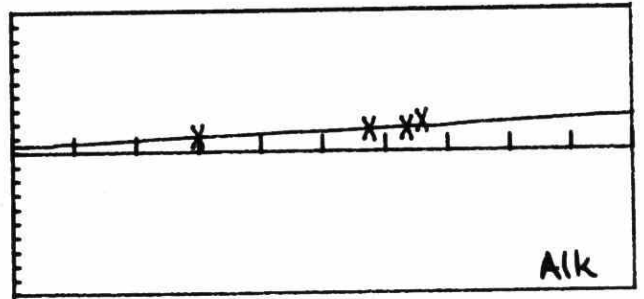
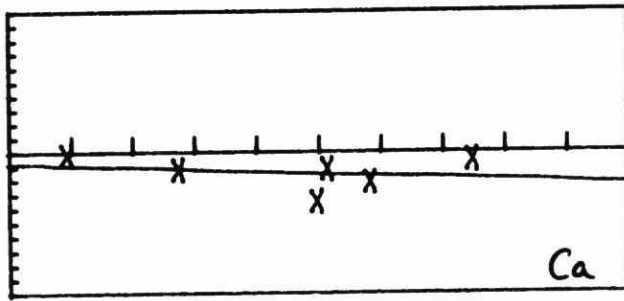
Minerals III

LAB 4



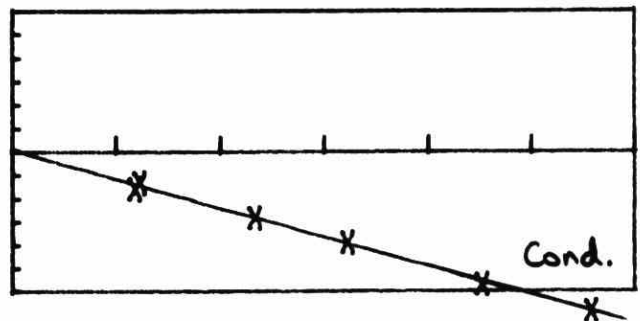
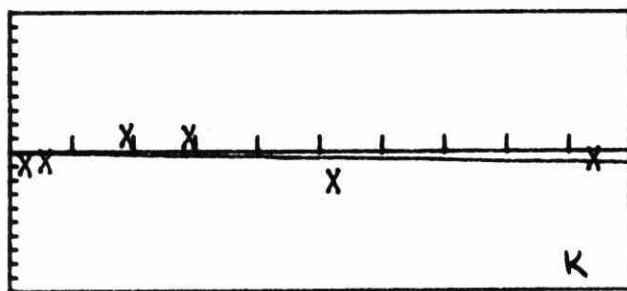
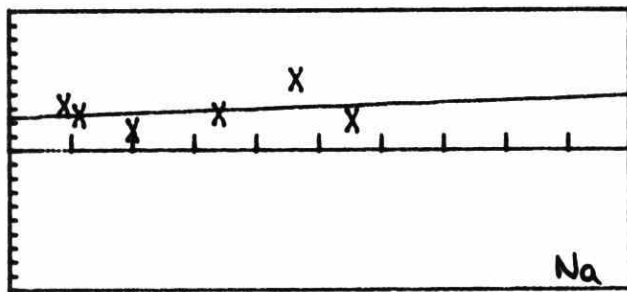
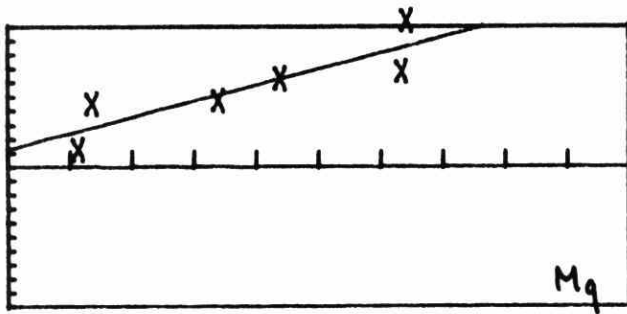
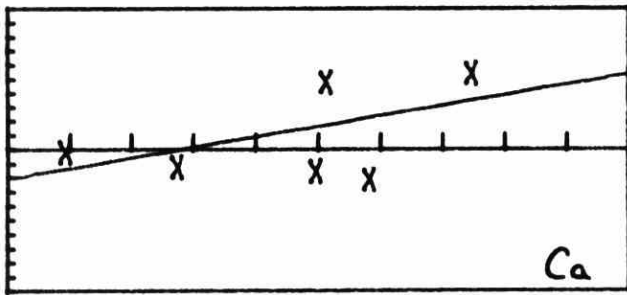
Minerals III

LAB 5



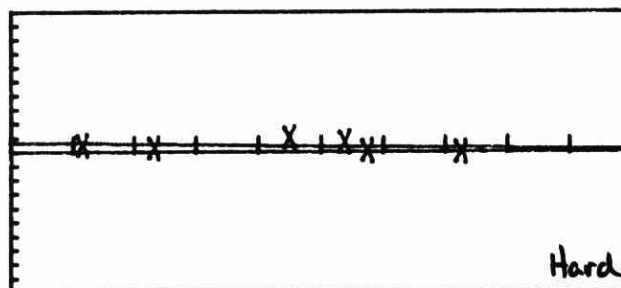
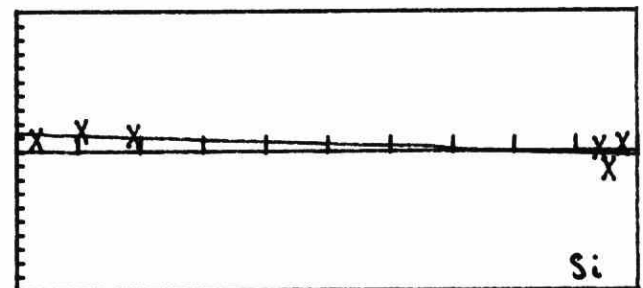
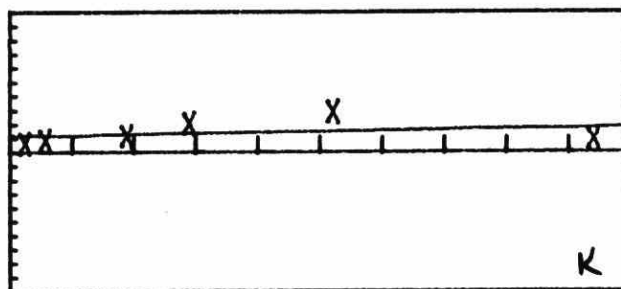
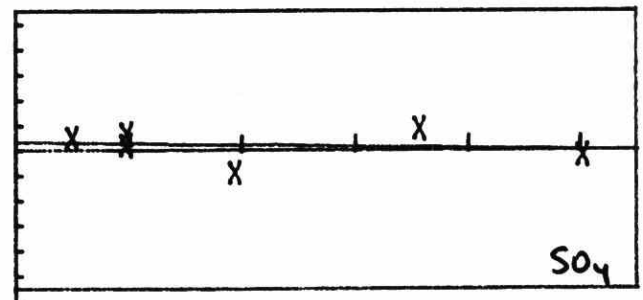
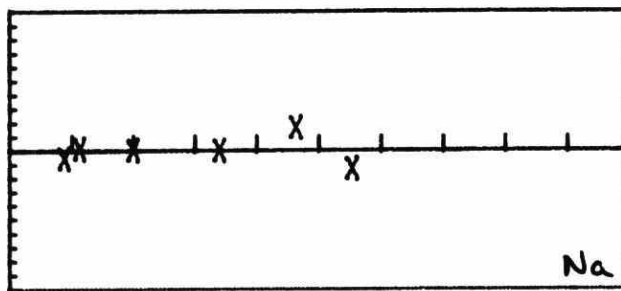
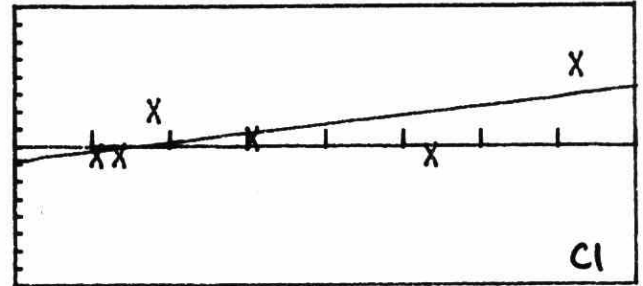
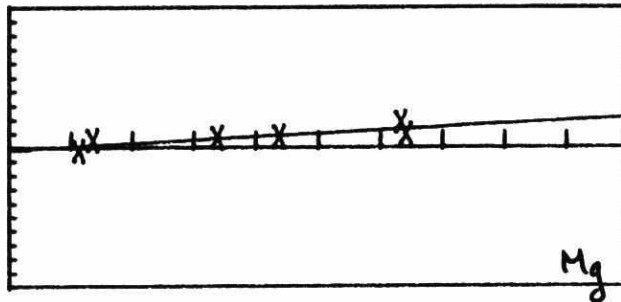
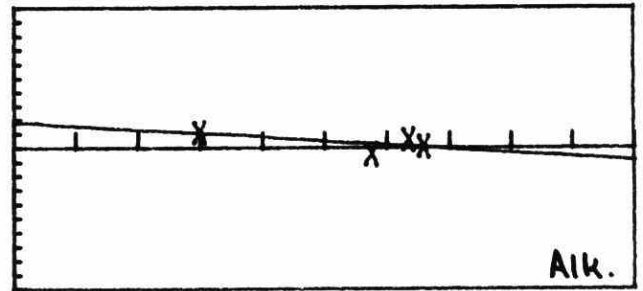
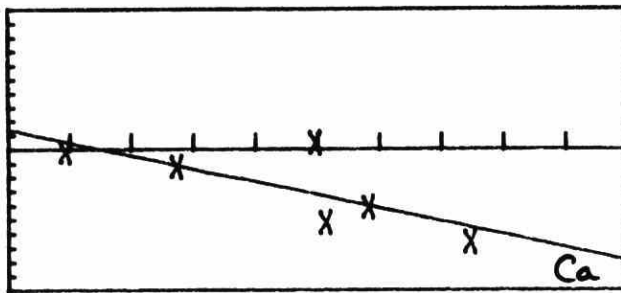
Minerals III

LAB 6



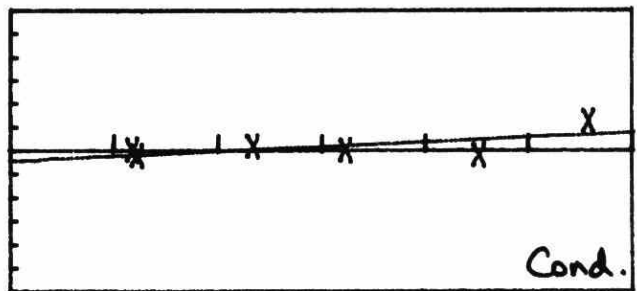
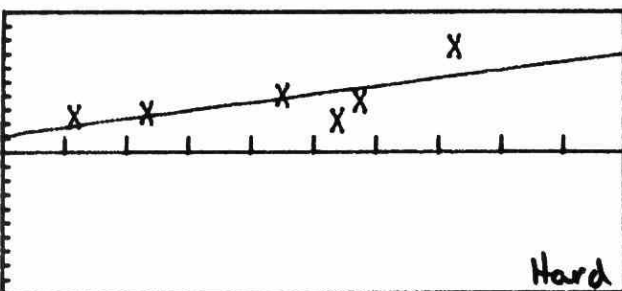
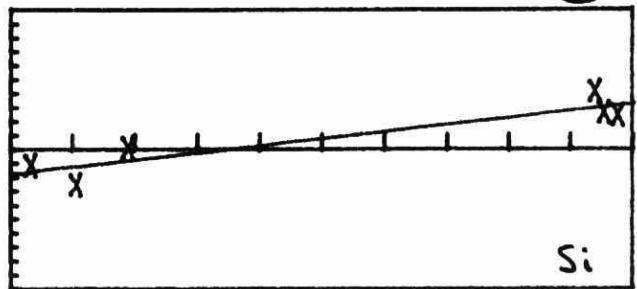
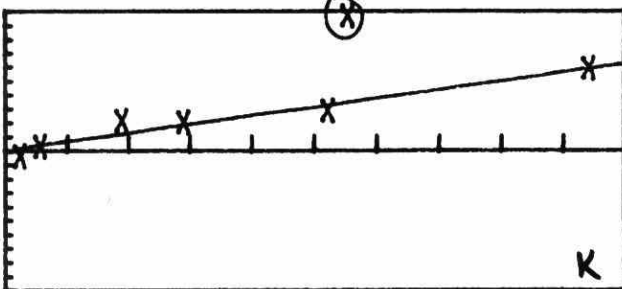
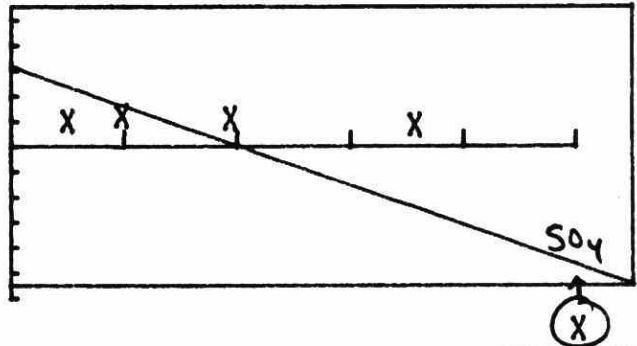
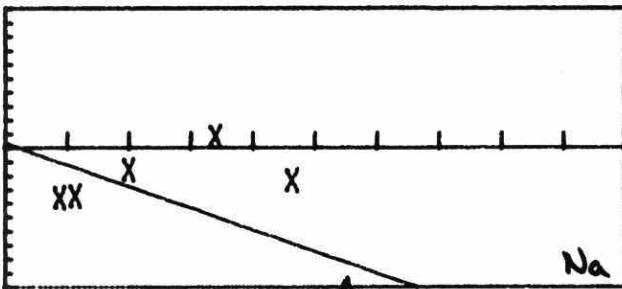
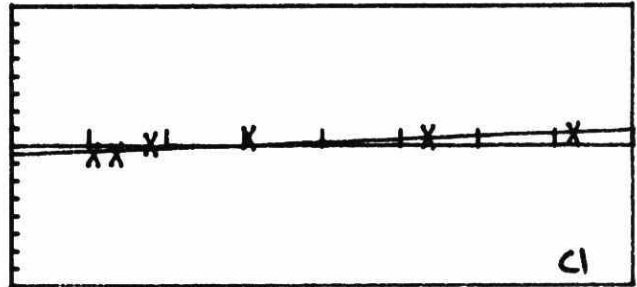
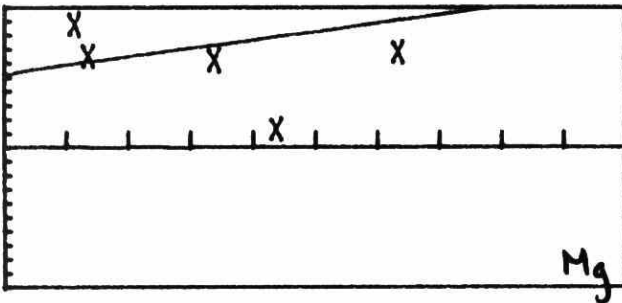
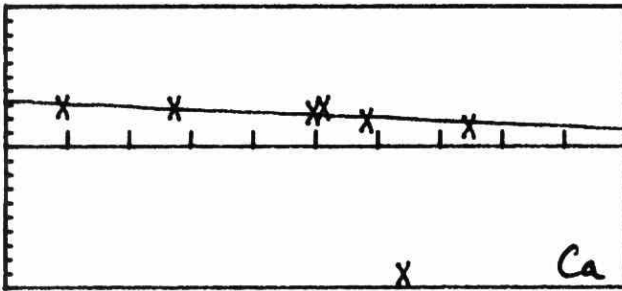
Minerals III

LAB 7



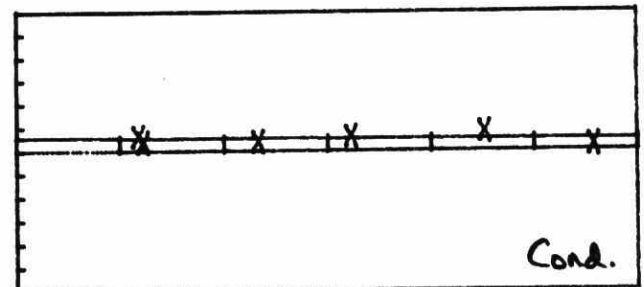
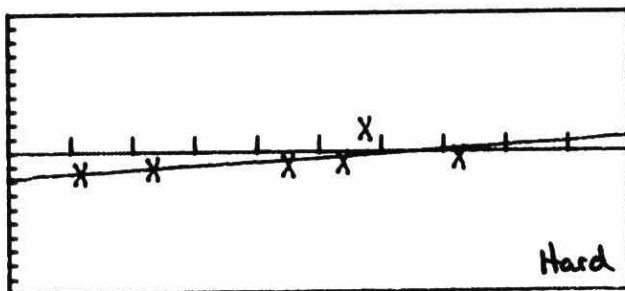
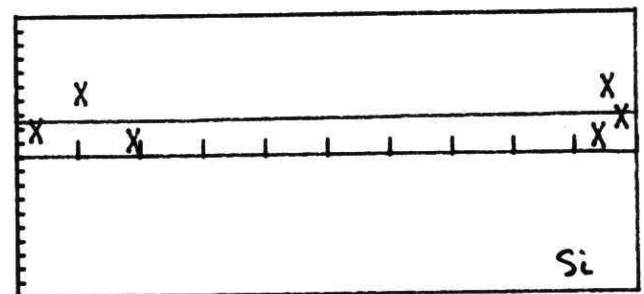
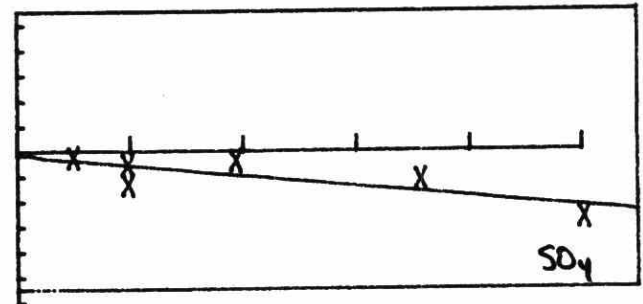
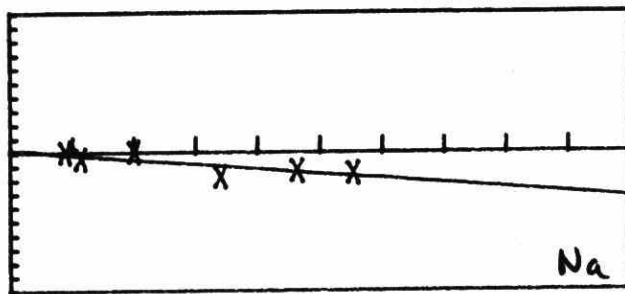
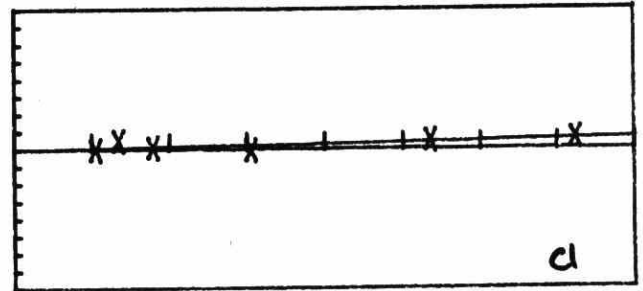
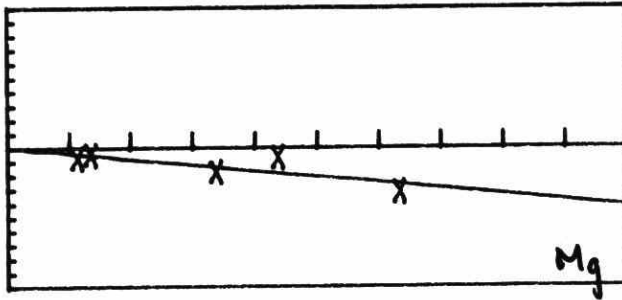
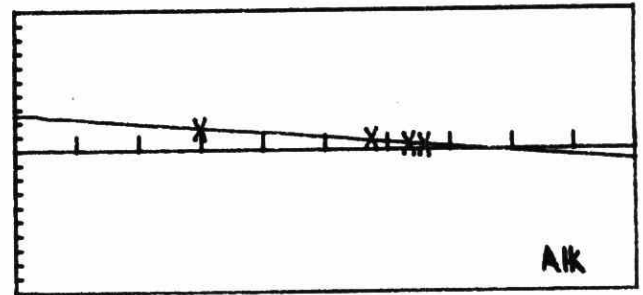
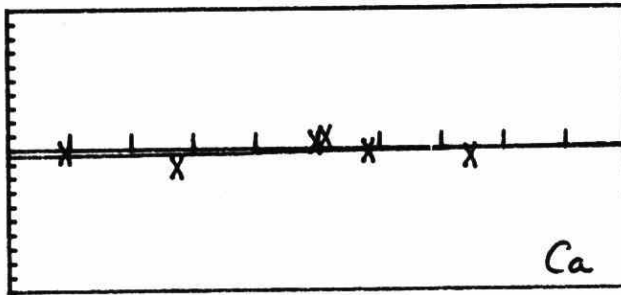
Minerals III

LAB 8



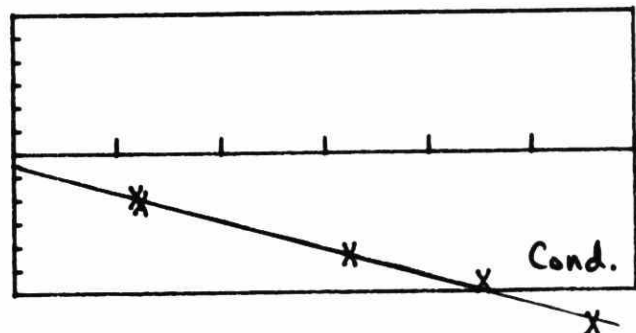
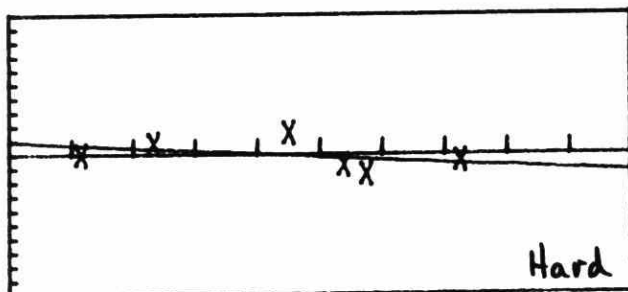
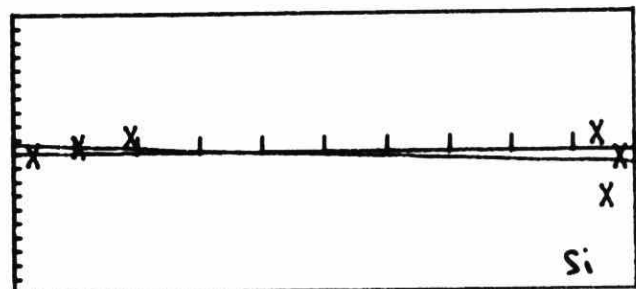
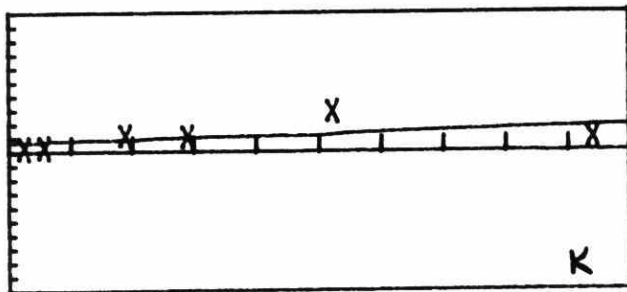
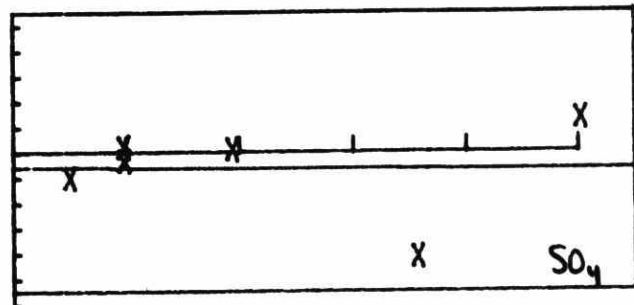
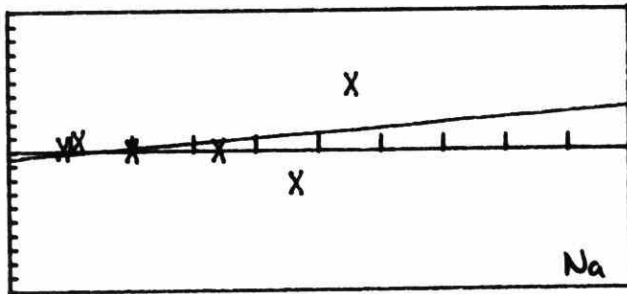
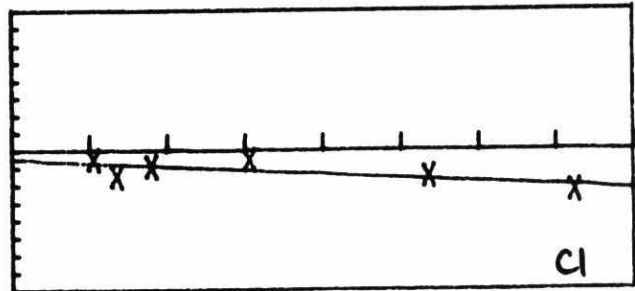
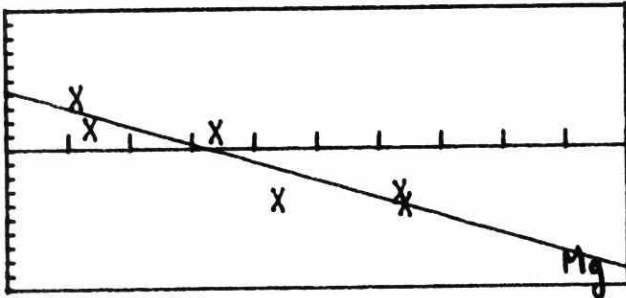
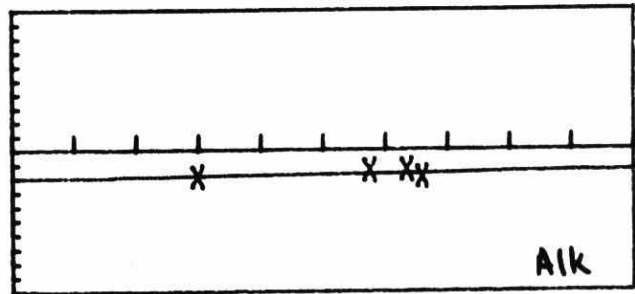
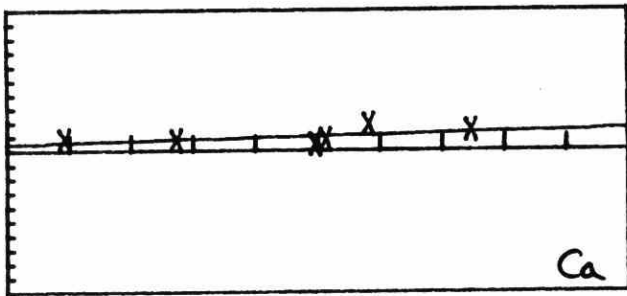
Minerals III

LAB 9



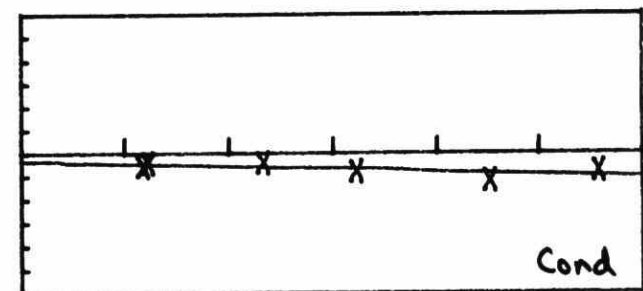
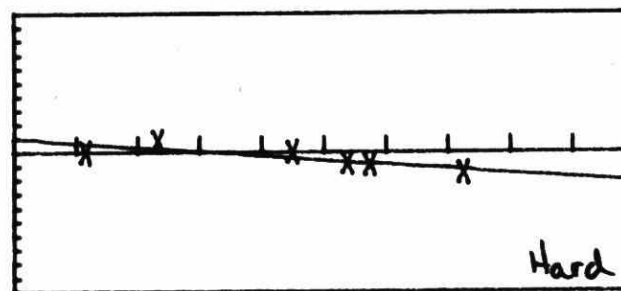
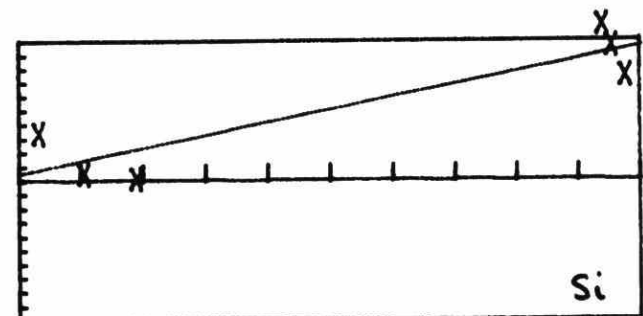
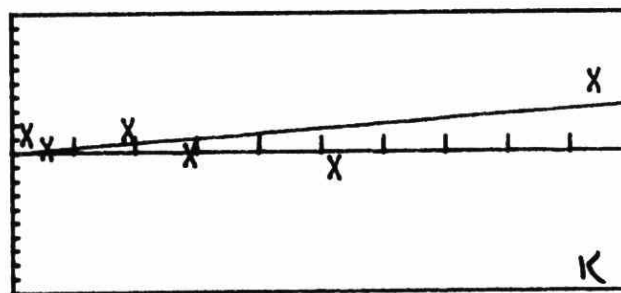
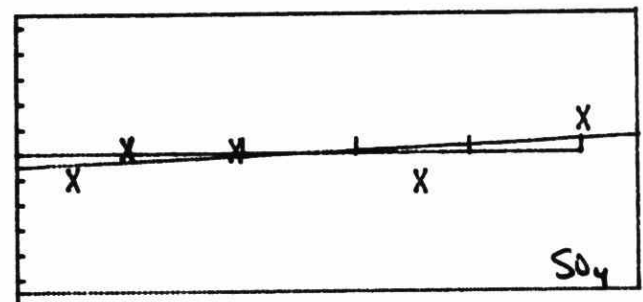
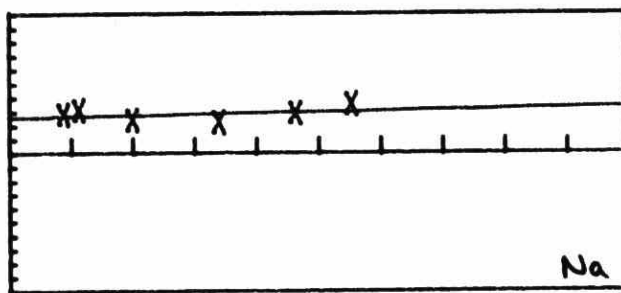
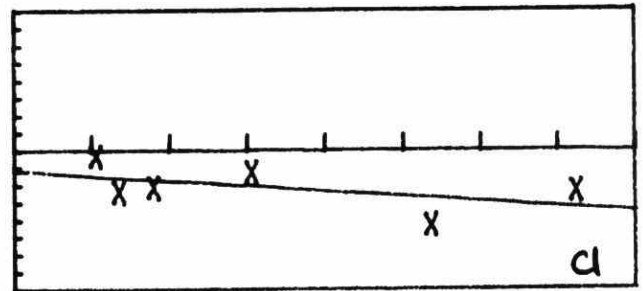
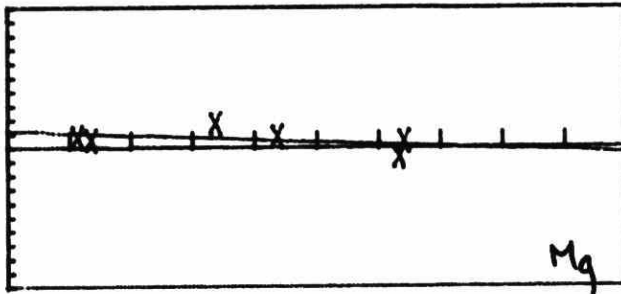
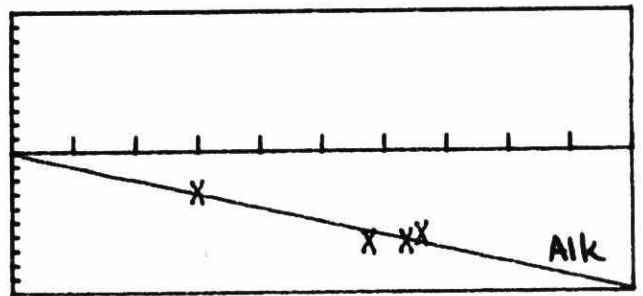
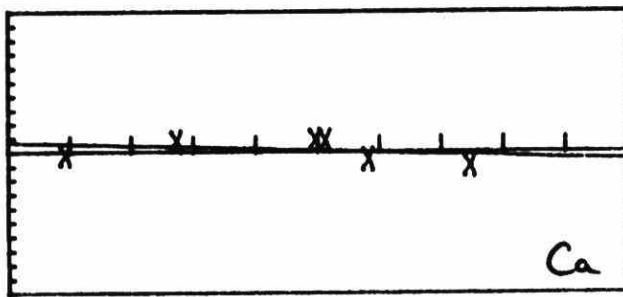
Minerals III

LAB 10



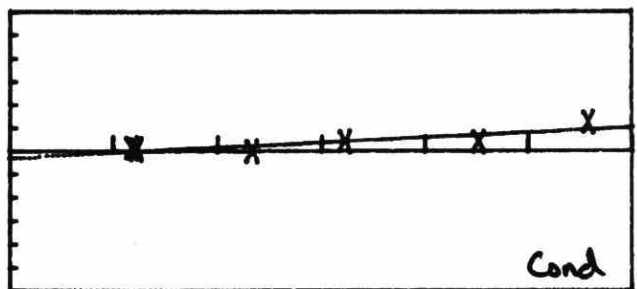
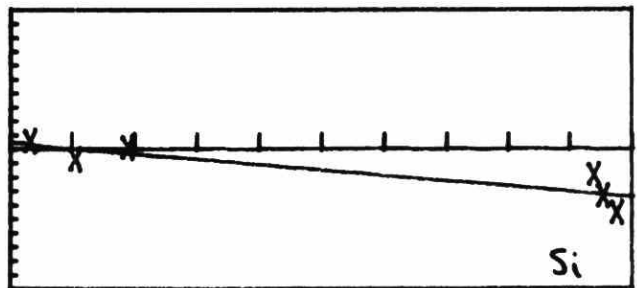
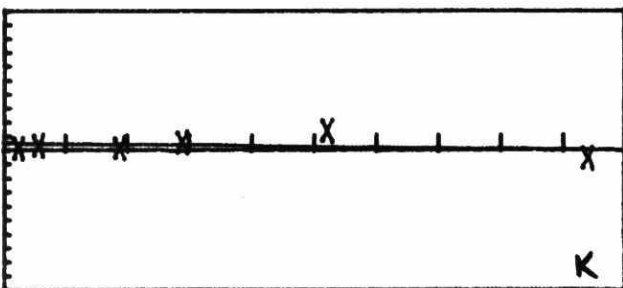
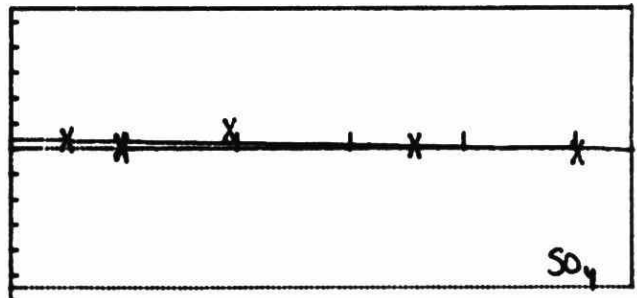
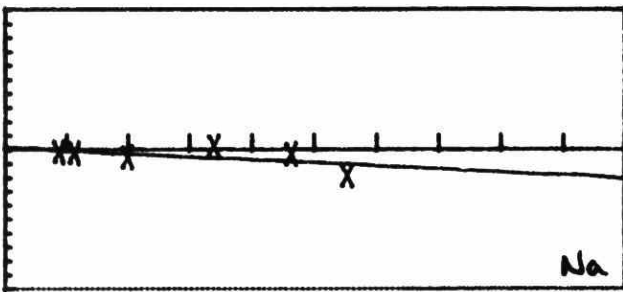
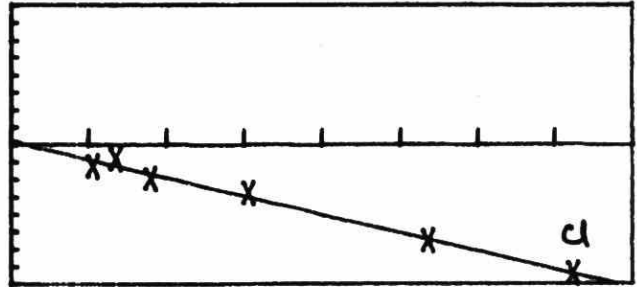
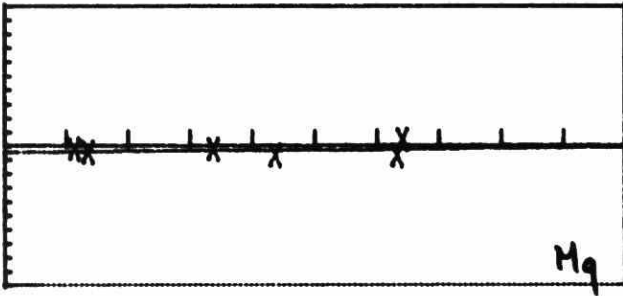
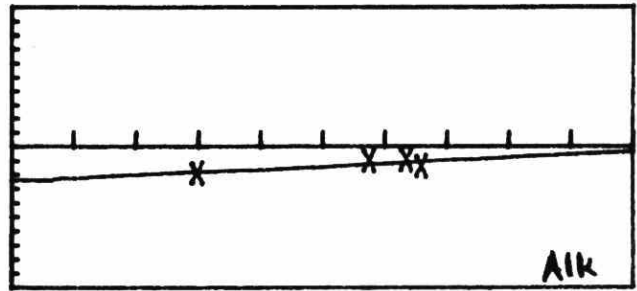
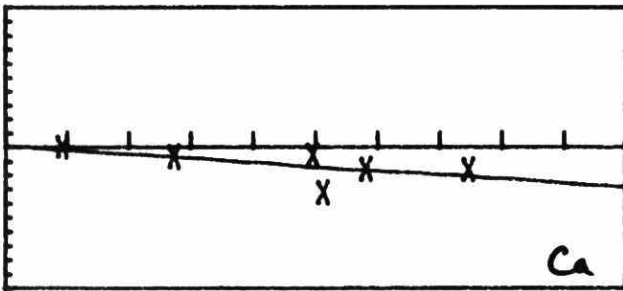
Minerals III

LAB 11.



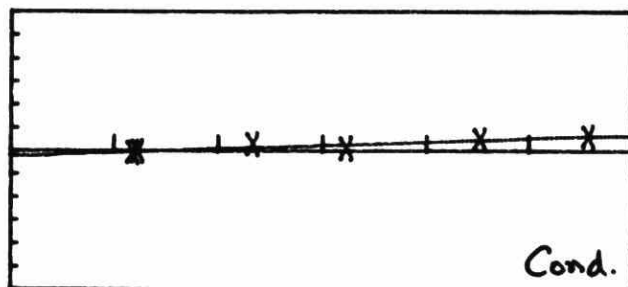
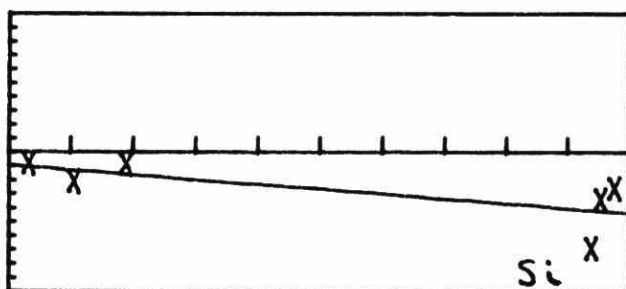
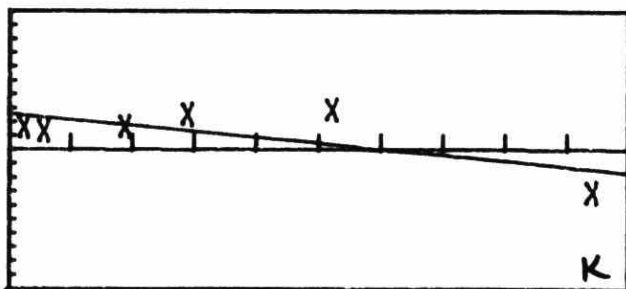
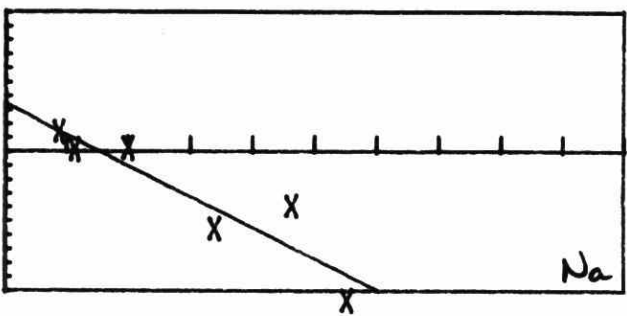
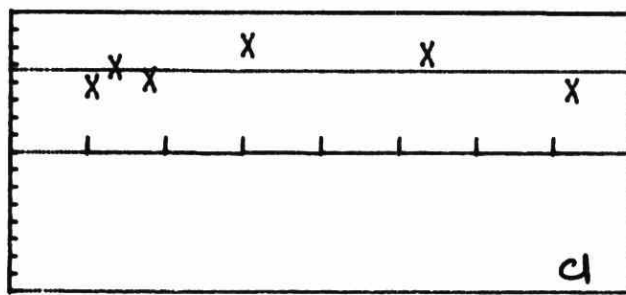
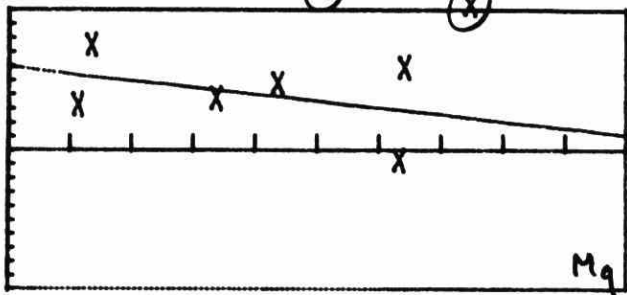
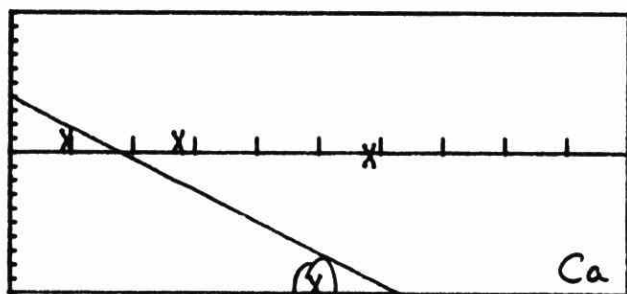
Minerals III

LAB 12.



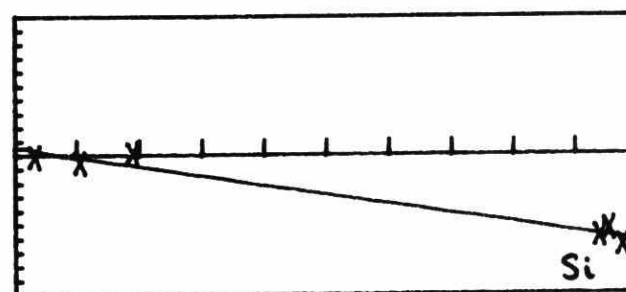
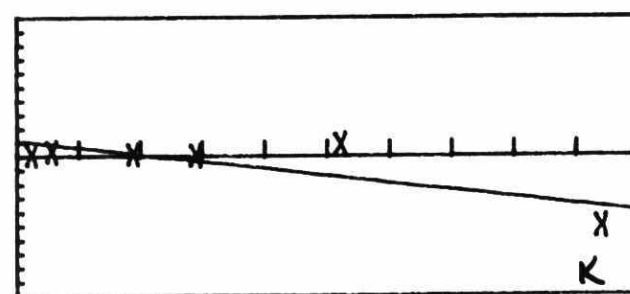
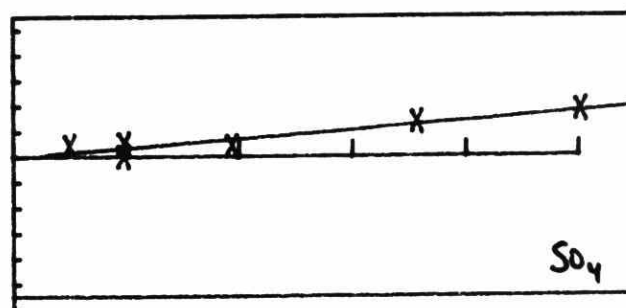
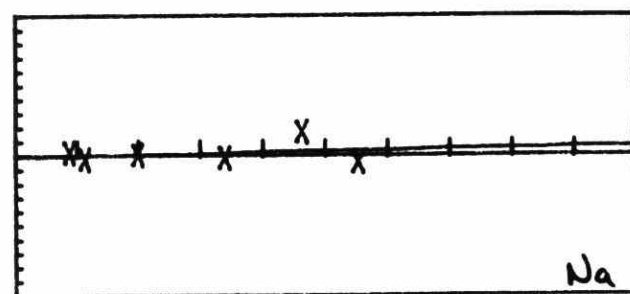
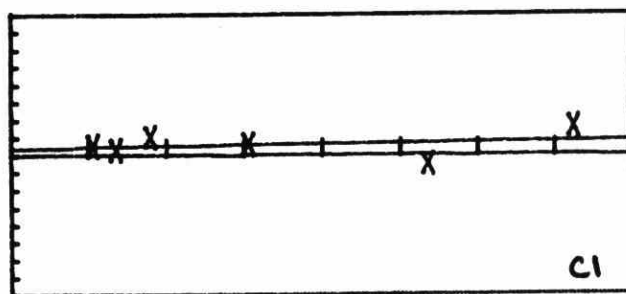
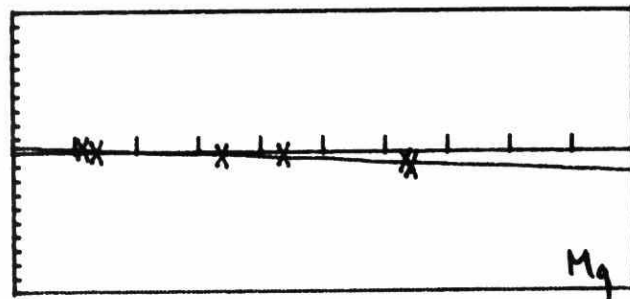
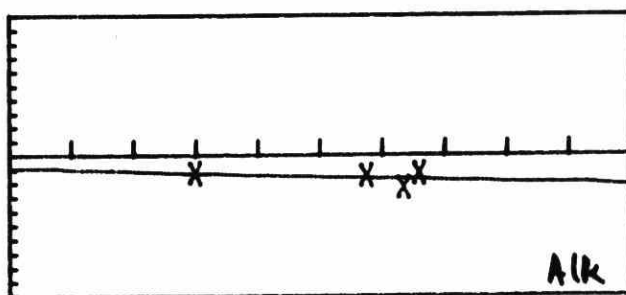
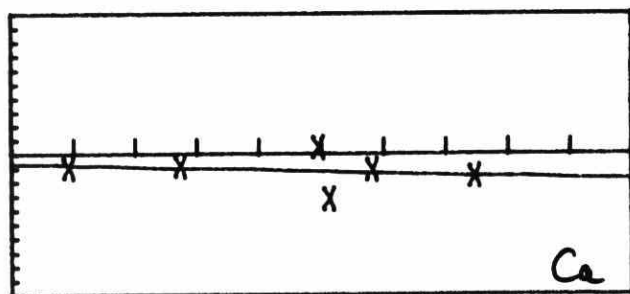
Minerals III

LAB 13.



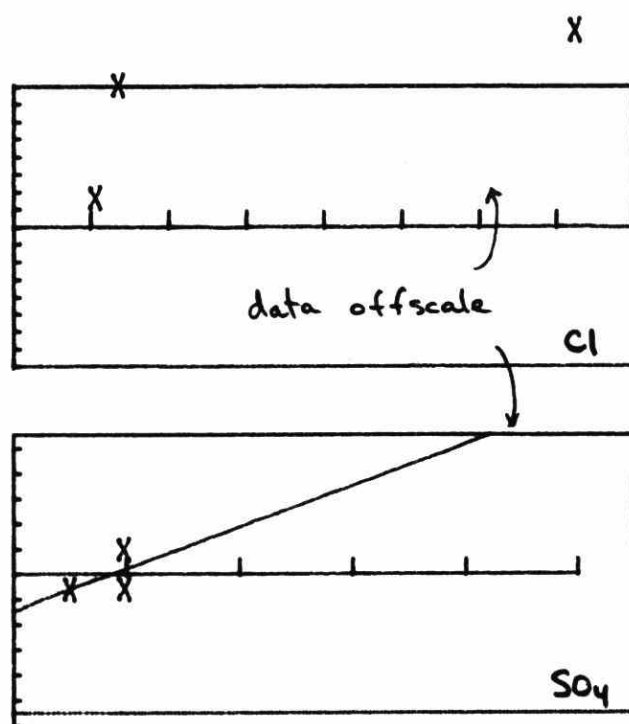
Minerals III

LAB 14



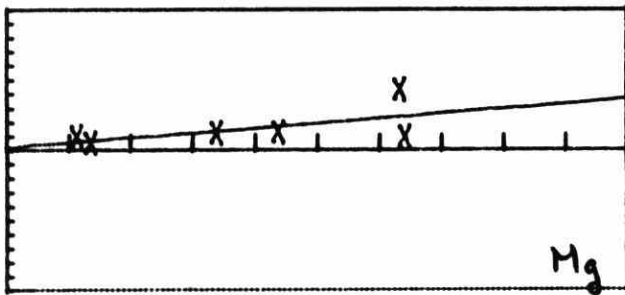
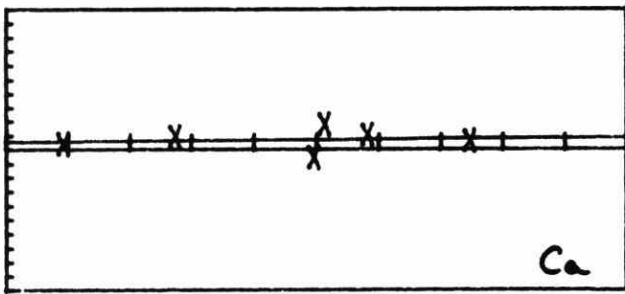
Minerals III

LAB 15



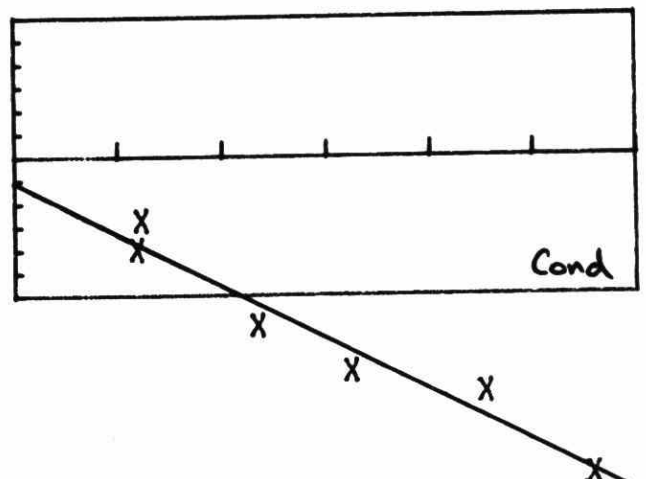
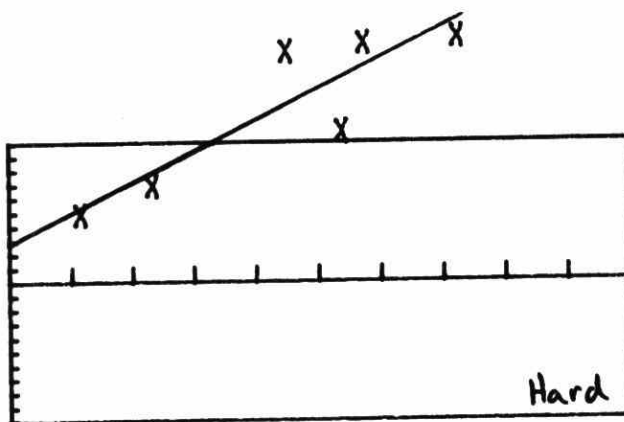
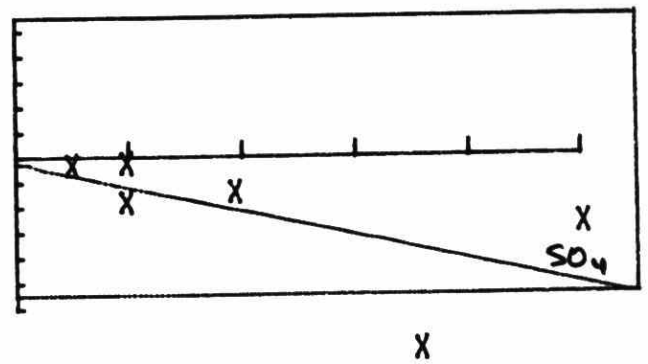
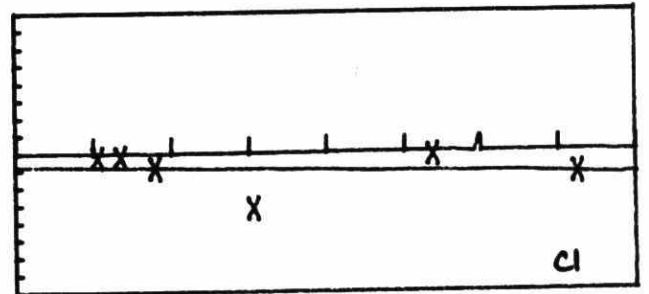
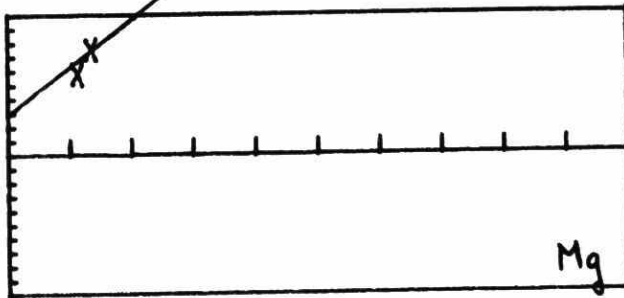
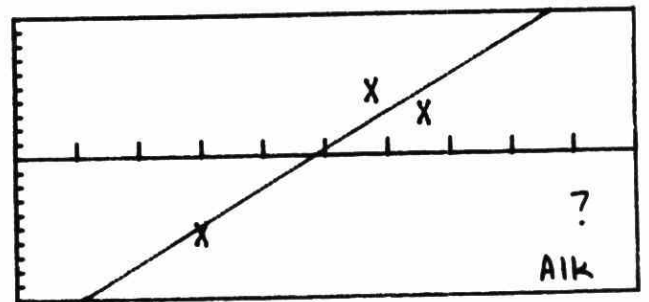
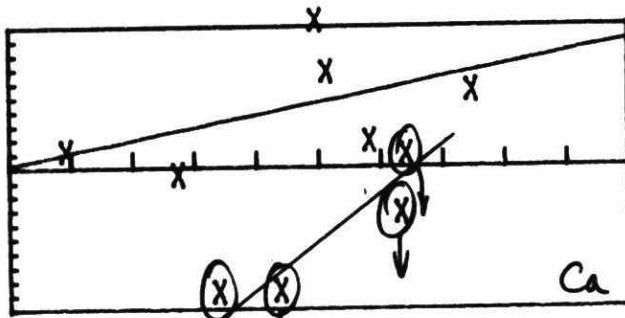
Minerals III

LAB 16.



Minerals III

LAB 18



Minerals III

Lab # 1

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
K	0.716	0.968	0.345	-0.070	11.68	0.93
Cond	-2.8	3.0	2.7	-0.9	-0.63	-0.43

Lab # 2

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	0.50	0.54	0.33	-0.23	3.27	0.79
Mg	1.32	1.17	0.34	-0.34	21.61	0.96
Na	0.50	0.39	0.31	0.18	2.15	0.59
K	-0.520	0.388	0.183	-0.222	-4.43	-0.88
Hard	0.2	8.0	3.6	-12.2	14.07	0.89
Alk	1.08	0.83	0.40	-0.85	3.56	0.88
Cl	0.58	0.85	0.81	0.87	-0.88	-0.29
Cond	-68.9	44.8	1.4	-1.5	-22.42	-1.00

Lab # 3

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	0.67	0.48	0.44	0.31	1.57	0.42
Mg	-0.15	1.00	0.51	1.12	-16.68	-0.86
Na	2.40	3.11	1.36	-1.44	26.25	0.90
Hard	1.2	2.0	2.0	1.0	0.19	0.05
Alk	0.33	2.04	1.21	4.73	-8.12	-0.81
Cl	10.41	4.31	4.19	11.62	-3.65	-0.24
Cond	-7.6	14.2	9.7	8.0	-5.17	-0.73

Lab # 4

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	1.34	1.20	1.20	1.29	0.18	0.02
Mg	0.02	0.94	0.71	0.92	-11.86	-0.66
Na	-0.80	0.46	0.36	-1.20	2.70	0.62
K	-0.170	0.236	0.226	-0.228	0.86	0.28
Hard	2.9	0.6	0.3	2.0	0.92	0.83
Alk	0.83	0.39	0.34	1.32	-0.91	-0.47
Cl	0.74	0.45	0.45	0.81	-0.21	-0.13
SO4	-1.79	3.90	2.12	1.79	-8.26	-0.84
Si	-0.009	0.026	0.020	-0.025	2.97	0.65
Cond	-24.6	28.2	6.5	16.8	-13.75	-0.97

Lab # 5

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-0.75	0.63	0.65	-0.41	-1.52	-0.29
Mg	-0.20	0.09	0.08	-0.12	-1.01	-0.56
Na	-0.20	0.28	0.26	-0.05	-1.05	-0.40
K	0.197	0.273	0.141	-0.006	3.01	0.86
hard	-2.8	2.1	1.9	-4.4	1.86	0.45
Alk	1.58	0.48	0.25	0.48	2.04	0.86
Cl	-0.01	0.70	0.66	-0.31	0.91	0.36
SO4	-1.12	3.06	1.70	1.66	-6.43	-0.83
Si	0.013	0.023	0.014	-0.006	3.57	0.80
Cond	-3.3	8.5	4.5	7.7	-3.64	-0.85

Lab # 6

Deviation from adjusted averages

Minerals III

Lab # 6

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	0.42	1.88	1.66	-1.10	6.76	0.47
Mg	1.13	0.68	0.33	0.26	11.42	0.87
Na	1.42	0.69	0.67	1.19	1.56	0.24
K	-0.070	0.279	0.272	-0.014	-0.82	-0.23
Cond	-36.9	25.0	1.3	0.8	-12.53	-1.00

Lab # 7

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-1.41	1.62	1.07	0.68	-9.30	-0.75
Mg	0.15	0.15	0.08	-0.03	2.38	0.84
Na	0.00	0.54	0.54	-0.03	0.21	0.04
K	0.280	0.194	0.187	0.235	0.66	0.27
Hard	0.9	0.9	0.8	1.3	-0.50	-0.30
Alk	0.33	0.83	0.62	1.81	-2.73	-0.67
Cl	0.91	2.32	1.81	-0.80	5.17	0.62
SO4	0.38	1.43	1.41	0.67	-0.66	-0.18
Si	0.004	0.011	0.007	0.013	-1.64	-0.76

Lab # 8

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	1.17	0.33	0.19	1.63	-2.05	-0.81
Mg	1.52	1.07	1.02	1.05	6.05	0.29
Na	-2.12	3.16	2.68	0.16	-15.58	-0.53
K	0.430	0.495	0.119	0.012	6.21	0.97
Hard	7.5	4.4	3.2	2.4	5.83	0.68
Cl	0.08	0.56	0.30	-0.49	1.73	0.85
SO4	-1.21	8.52	5.17	6.30	-15.64	-0.79
Si	0.009	0.028	0.011	-0.017	5.01	0.92
Cond	1.7	6.0	4.6	-4.0	1.92	0.64

Lab # 9

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-0.08	0.41	0.40	-0.21	0.59	0.19
Mg	-0.28	0.26	0.15	0.00	-4.22	-0.81
Na	-0.42	0.45	0.26	0.09	-3.43	-0.82
Hard	-1.1	2.5	2.0	-3.6	2.79	0.57
Alk	0.73	0.69	0.10	2.56	-3.37	-0.99
Cl	0.24	0.34	0.26	-0.01	0.77	0.64
SO4	-2.12	2.04	1.18	-0.31	-4.19	-0.82
Si	0.026	0.018	0.018	0.025	0.23	0.07
Cond	5.1	2.3	2.3	5.4	-0.11	-0.09

Lab # 10

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	0.50	0.29	0.25	0.25	1.11	0.50
Mg	-0.15	0.74	0.31	0.85	-13.04	-0.91
Na	0.28	1.28	1.23	-0.23	3.54	0.29
K	0.219	0.210	0.190	0.140	1.16	0.43
Hard	-0.1	2.4	2.1	1.8	-2.17	-0.46
Alk	-1.67	0.32	0.29	-2.00	0.62	0.39
Cl	-1.26	0.79	0.50	-0.53	-2.21	-0.77
SO4	-1.29	4.20	4.20	-1.20	-0.19	-0.02
Si	-0.002	0.019	0.017	0.006	-1.59	-0.44
Cond	-42.9	27.3	2.6	-5.1	-12.02	-1.00

Minerals III

Lab # 11

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	0.05	0.44	0.41	0.34	-1.29	-0.38
Mg	0.12	0.18	0.15	0.24	-1.61	-0.48
Na	1.42	0.26	0.25	1.31	0.74	0.30
K	0.229	0.473	0.394	0.001	3.38	0.55
Hard	-0.8	1.8	1.0	1.9	-3.08	-0.85
Alk	-5.42	2.10	0.70	-0.14	-9.74	-0.94
Cl	-2.16	1.50	1.25	-1.17	-2.99	-0.56
SO4	-0.12	2.02	1.85	-1.03	2.10	0.41
Si	0.054	0.053	0.023	0.005	9.12	0.90
Cond	-6.9	3.3	2.3	-3.3	-1.19	-0.72

Lab # 12

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-0.63	0.64	0.51	0.03	-2.93	-0.60
Mg	-0.07	0.09	0.09	-0.10	0.35	0.19
Na	-0.25	0.41	0.33	0.07	-2.22	-0.58
K	0.064	0.141	0.137	0.094	-0.45	-0.25
Alk	-1.29	0.55	0.34	-2.43	2.09	0.78
Cl	-3.29	2.93	0.33	0.18	-10.48	-0.99
SO4	0.35	0.72	0.65	0.69	-0.80	-0.44
Si	-0.016	0.023	0.010	0.004	-3.87	-0.89
Cond	3.7	5.1	2.6	-2.8	2.18	0.86

Lab # 13

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-3.00	4.07	2.86	2.01	-22.27	-0.71
Mg	0.82	0.63	0.58	1.18	-4.81	-0.40
Na	-1.53	2.58	1.01	1.72	-22.26	-0.92
K	0.230	0.481	0.349	0.519	-4.28	-0.69
Cl	4.69	1.16	1.16	4.71	-0.04	-0.01
Si	-0.028	0.025	0.017	-0.010	-3.42	-0.71
Cond	2.4	3.2	1.1	-2.0	1.48	0.94

Lab # 14

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Ca	-0.61	0.67	0.65	-0.36	-1.12	-0.22
Mg	-0.07	0.11	0.04	0.08	-1.96	-0.93
Na	0.08	0.43	0.42	-0.03	0.80	0.20
K	-0.120	0.494	0.298	0.224	-5.10	-0.80
Alk	-1.59	0.61	0.54	-0.89	-1.31	-0.44
Cl	0.59	0.81	0.80	0.42	0.52	0.18
SO4	1.51	1.51	0.54	-0.02	3.54	0.93
Si	-0.031	0.036	0.006	0.005	-6.71	-0.98

Lab # 15

Param.	Deviation from adjusted averages					Corr'n
	Avg.D	sd	Res.sd	Blank	%Slope	
Cl	29.96	31.41	29.86	18.37	35.03	0.31
SO4	-0.15	2.54	2.19	-2.86	16.47	0.51

Lab # 16

Lab # 18

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INTERCOMPARISON EVALUATION: MINERALS AND
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1976

DATE DUE	BORROWER'S NAME	ROOM NUMBER
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